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The Lighting of the Home

AT the time this issue appears the foreshadowed E.D.A.—E.L.M.A. campaign of propaganda dealing with the lighting of the home will have been launched. Some of its main features were outlined in a very able speech by Mr. H. B. Atkinson at the E.D.A. luncheon, presided over by General Sir Philip Nash, G.C.M.G., C.B., on September 17th. On p. 293 we give a summary of the chief steps being taken. There is, firstly, the National Ballot Competition, with a first prize of an electric home or £2,000 in cash and other valuable prizes. The first part of the competition, whilst presenting a simple problem in illuminating engineering, has a certain educational value. Committees are being formed in several main districts to supervise other forms of propaganda, including advertising, articles in the press, local model electric homes, etc. The manner in which the whole campaign has been prepared, including the issue of many attractive leaflets and booklets, shows great skill and thoroughness, and reflects great credit on the enterprise of Mr. J. W. Beauchamp and his associates.

We are also very glad to note that the E.L.M.A. Lighting Service Bureau is co-operating in the campaign. Practical demonstrations and lectures on domestic lighting will be arranged in the chief industrial centres, and the familiar revolving model electric home will go on tour. From the figures presented one can see that there is plenty of room for propaganda on behalf of the electrical industry —it is stated that out of seven million houses situated in areas supplied with electricity, only 1,400,000 are wired at present. But we consider that any scheme which did not include the idea of "service" to the consumer within its scope would fail to make a strong appeal to the consumer, and we are, therefore, very glad to see that an effort is being made to impress on him the distinction between bad and good methods of lighting and the advantages of "Better Lighting in the Home." The E.L.M.A. handbook dealing with domestic lighting is a useful production, and contains a number of effective illustrations contrasting correct and defective lighting arrangements.

The feature of the campaign that chiefly interests us is the influence it is likely to have in bringing about a higher conception of the benefits of good domestic lighting. During the next few months we shall be devoting special attention to this subject in *The Illuminating Engineer*, and it is proposed to devote one of the early meetings of the Illuminating Engineering Society to a full discussion on the subject. At this meeting the aim will be not only to illustrate the importance of good lighting in the home, but to establish the main guiding principles to be adopted in domestic lighting. The first point for householders to grasp is that good lighting is not to be regarded as a luxury, but as a necessity. It is, we believe, now generally recognized that much of the past propaganda of firms in the lighting industry, laying stress on the economies to be made in the lighting bill by using this or that lamp or appliance, was ill-advised. It helped to create an impression, which persists to this day, that lighting is essentially a field where one should economize, however lavish may be our expenditure in other directions. The aim now must be to create the impression that the cost of light is so small in comparison with the benefits its confers that it is a "penny wise pound foolish" policy to scrimp expenditure on illumination.

This being admitted, the next step is to ensure that the light provided is wisely and properly used—that the very best is got from the great variety of lamps and devices available to-day. It is here that service to the consumer comes in, and where this journal and the Illuminating Engineering Society will play an important part. Suggestions from an impartial source are welcomed by the public. A lead from the Society in this direction will carry weight, and recommendations on fundamental principles will receive recognition. So far as the ordinary home of moderate size is concerned, the principles to be adopted in lighting the various rooms can be clearly indicated. But it should not be thought that the subject is in any way exhausted. The introduction of many new devices and methods has revolutionized practice of the past, and many debatable points could be suggested.

When we come to houses of a superior class the possibilities of novel and artistic treatment are endless, and it is in this field that further discussion is chiefly to be desired. Possibilities here depend very greatly on the co-operation of the architect and the decorator, and many new and ingenious effects involving colour are now being tried. We suggest, therefore, that a special feature should be made of enlisting the aid of architects, artists, decorators, and others concerned in forthcoming discussions on this subject. Theoretical and practical aspects of the subject have to be reconciled. The home presents a specially favourable opportunity for the concerted action of various experts, and the Illuminating Engineering Society is in a specially favourable position to bring them together, and thus to enable domestic lighting in all its aspects to be thoroughly discussed.

Progress in Public Lighting

ON pp. 290-292 we present a summary of the papers read at the Conference of the Institution of Public Lighting Engineers, held in Newcastle during September 14th-16th. The gathering was a representative one, and included members and delegates, engineers attached to firms in the lighting industry and a strong contingent of those locally concerned with the public lighting. The authorities at Newcastle co-operated wholeheartedly in the proceedings and in the entertainment of visitors, who carried away pleasant recollections of the welcome of Newcastle's genial Lord Mayor (Councillor John Oates). Socially such gatherings are of considerable value, and afford an opportunity for public lighting engineers to record experience and exchange views. It was encouraging to observe the pleasant relations existing between the authorities in Newcastle and their public lighting engineer (Mr. R. Davison), whose work is evidently appreciated.

Mr. Davison's Presidential Address was of a practical nature, and Mr. Colquhoun's paper contained a record of much painstaking work in Sheffield and of methods of overcoming difficulties when improving the lighting of this city. One fact brought out at the conclusion of his paper may not be generally known, that whereas in Scottish boroughs the provision of suitable public lighting is a legal obligation, there is no similar provision in English law. It was likewise remarked in Mr. Beveredge's paper that there is at present no standard schedule of "lighting hours." In the discussion the desirability of standard practice was accepted, but it was pointed out that much depends on the facilities available in any area for the automatic lighting-up and extinction of lamps.

It is evident that much remains to be done on the technical side in street lighting, for example in determining the basis on which improvements in street lighting are to be judged; such data are necessary in presenting a case to public lighting authorities. In Mr. Fryer's able paper the problem of lighting important arterial routes between cities was briefly discussed. We have always believed that ultimately the lighting of such roads should become a national, rather than a parochial, obligation. No doubt this aspect would receive sympathetic consideration from the Ministry of Transport, if approached by a thoroughly representative deputation, prepared with definite suggestions.

Mention should also be made of the services rendered by firms in the lighting industry, who arranged quite a comprehensive exhibit of lamps and lighting appliances, both gas and electric types being well represented. Such a collection deserves study by public lighting engineers, and we would suggest that in future a special opportunity for demonstrations and explanations of them might be provided in the official programme.

Conferences of this kind afford an excellent opportunity for public lighting engineers to meet and exchange views, and form a useful supplement to the work of the Illuminating Engineering Society. We shall watch the progress of the Institution with interest, and trust that there will be many future opportunities of useful co-operation between the two bodies.

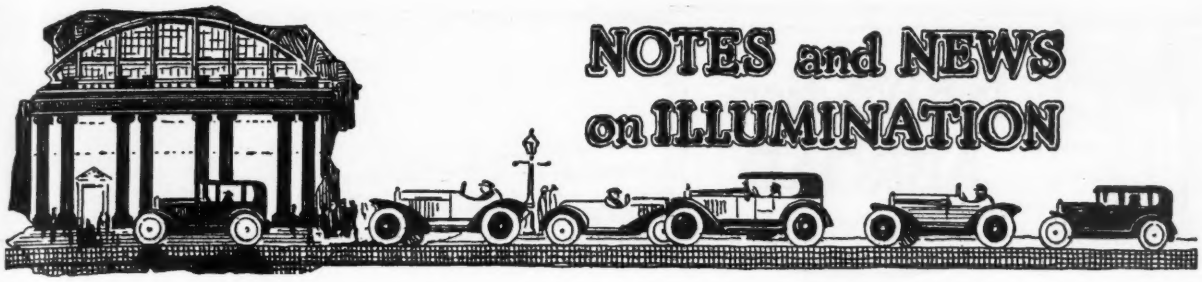
The 20th Anniversary Convention of the Illuminating Engineering Society (U.S.A.)

IN our last issue we presented a list of the papers presented at the Twentieth Anniversary Convention of the Illuminating Engineering Society in the United States, and also gave a summary of Mr. Luckiesh's Presidential Address. On pp. 283-287 we are now able to give an account of some of the papers read, and we hope to deal with others in subsequent issues.

Mr. Luckiesh's address contained a thoughtful analysis of the functions and growth of the Society. It was shown how very wide and varied the applications of light have become since the Society was first started, twenty years ago. It is true that during the last ten years the membership of the American Society has remained almost stationary. But this is not to be taken as a measure of general interest in the subject—still less as evidence of technical stagnation. Progress in lighting during recent years will bear comparison with that in any field of technical achievement. There is certainly far greater general appreciation of the benefits of good illumination than at any previous time. The problem of attracting members, which has been likewise proved difficult in this country, arises largely from the special nature of the subject, and is to be met by new methods and organization. It is only recently that the principles of illumination have become sufficiently established to make a general educational campaign feasible. We have every hope that, both in the United States and in this country, there will be satisfactory progress in this respect during the next few years.

The papers dealt with in this issue would alone serve to indicate the wide scope of illuminating engineering. Special interest attaches to Mr. A. J. Sweet's analysis of street-lighting service, in which an attempt to evaluate the various features, visibility, glare, artistic appearance, etc., is made. In view of the Conference of the Institution of Public Lighting Engineers, which has just taken place, this contribution to the theory of street lighting is a timely one. There are several papers dealing with physiological aspects, such as "Lighting and Contrast," and with Daylight Illumination. Equally useful are those dealing with applications of light, which include "Light in Medicine and Surgery," "Church Lighting," "Under-water Illumination," etc. A special feature of the Convention was the series of seven contributions by various authors under the heading of "Twenty Years of Lighting Progress." We look forward to the receipt of these papers, which should furnish an excellent review of developments in the lighting art.

In a very few years the Illuminating Engineering Society in this country will likewise be celebrating its twentieth anniversary. Meantime it has cabled to the United States a congratulatory message wishing success to the Convention and future prosperity to the American Illuminating Engineering Society. During past years the societies have learned much from each other, and it is our sincere hope that in the future there will be many fruitful opportunities for co-operation. The growing importance attaching to the work of the International Illumination Commission, interchange of views and knowledge of each other's activities, is of special consequence. We are glad to think that *The Illuminating Engineer* is contributing to the realization of this aim by making known to readers in this country the work of the Society in the United States, which we have always watched with close attention and keen interest.



The Smoke Abatement Exhibition

At the Smoke Abatement Exhibition opened in Birmingham last month, there was one interesting feature —the support given both by gas and electrical concerns. As would naturally be expected the display by the gas industry was on a comprehensive scale, prominent features being the combined exhibit by Midland Gas Undertakings, the co-operation of the Birmingham Corporation Gas Department, and the stand of the B.C.G.A. But of equal interest was the joint electrical exhibit, in which numerous undertakings co-operated with the City of Birmingham Electric Supply Department and the E.D.A. The exhibit included an all-electric house and a model boiler house. Smoke abatement, therefore, like illuminating engineering, offers a field in which both gas and electrical concerns can take part. Both are interested in a movement which has for its object the elimination of the wasteful use of coal and consequent pollution of the atmosphere; illuminating engineers, too, are naturally sympathetic to any improvements which will check the present loss of health-giving sunlight by a smoke-laden atmosphere.

Do Black Envelopes Cause Eyestrain?

We hear of the use of black envelopes designed to defeat the Postmaster-General's plan to obtain revenue from advertisements on postmarks. Apparently some of these envelopes are already in use, the whole surface of the envelope being black, except for a small white panel about an inch wide and four inches long, provided for the address. Postmarks and advertisements in black ink would obviously be indecipherable on such a surface, and one could hardly doubt that the effort to read them would be "likely to cause strain on the eyes of the officer of the Post Office." Such envelopes might therefore be opposed to the regulations. The objection which many people feel to the idea of incorporating advertisements in postmarks is intelligible, and it would appear that the public could hardly be debarred from using envelopes which rendered them inconspicuous; the difficulty is that such methods would likewise make postmarks extremely difficult to read.

Efficient Shop-Window Illumination

Propaganda in favour of better lighting is developing apace. In *The Wireless Export Trader* we notice an account of an interview with Mr. L. Gaster, in which the principles of good shop-window lighting are explained. Mr. Gaster naturally emphasized, first of all, the avoidance of glare, but also the necessity for variation, and the skilful application of coloured light to render displays more attractive. He emphasized the important part played by light in attracting custom and pointed out how the method of lighting should be adapted to the character of the goods displayed. The interview was illustrated by several pictures from "Light and Illumination: Their Use and Misuse," a pamphlet which was reprinted from *The Illuminating Engineer* shortly before the war.

The Ideal Road

An important report dealing with certain aspects of concrete road development in England was presented at the International Road Congress in Milan last month. Concrete carriage-ways are considered to have the following advantages: (*a*) An ideal running surface for motor vehicles; (*b*) durability under rubber-tyred traffic; (*c*) a dustless and easily cleaned surface; (*d*) good visibility at night; (*e*) a surface not softened by heat or made brittle by frost; (*f*) a surface with minimum camber; and (*g*) a material for construction which can be found in almost all localities. The drawbacks are limited to lack of resilience, glare in bright sunshine, possible long interruption of traffic during repair, and the need for great care in construction. Reports are given of the successful conversion into concrete roads of 105 streets in Southwark of a total length of $11\frac{3}{4}$ miles, and of 20 miles of concrete highway in Surrey. The advantage (*d*), "good visibility at night," is doubtless an important one, as use of a light-coloured surface obviously greatly increases the range of a motor headlight of given power, and may therefore aid towards the solution of the glare problem. The low contrast between moving objects and the average tarred road surface is one of the difficulties in night driving.

The Future of Street Traffic Control

The report prepared by the late Superintendent Bassom, of Scotland Yard, which is being presented at the International Roads Congress, is full of interesting points. Superintendent Bassom, one of the greatest authorities on traffic problems, recognized what has since been made evident by experience during the great strike, that the limits of traffic-bearing capacity of main thoroughfares are being approached. Unless some comprehensive scientific plan of traffic control is evolved the confusion in future will be worse than at present. Entirely new schemes of dealing with the congestion are foreshadowed. Amongst these are the possible use of overhead routes for passengers and subways for traffic. The proposal is also thrown out that the tubes might be utilized for goods traffic during the late night and early morning hours, so as to afford a 24 hours' load. Something is also said on the subject of lighting. The author recognizes very keenly the great drawbacks of glare, and his insistence on the need for shading lights will be widely approved; though we may doubt whether the daring expedient of relying entirely on the flood-lighting of buildings for the illumination of main thoroughfares is likely to be realized in the immediate future.

Obituary

Benjamin Bark.

We record with great regret the death, on August 30th, of Mr. Benjamin Bark, who was in charge of the Welsbach Factory for over 25 years. He was considered one of the greatest experts in this country on gas mantle manufacture, and his advice on subjects relating thereto was in frequent demand. At the funeral, on September 2nd, Major Pringle attended, representing the Directors; Mr. W. H. White, representing the Chairman (Mr. J. R. Yates, who was abroad); and Mr. H. Talbot, the General Manager. Mr. L. Thurnauer, Managing Director of Messrs. Falk, Stadelmann & Co. Ltd.; Mr. Robert Cars, and a large number of business friends, trade representatives, and employees of the Company were present. Mr. Bark had only recently joined the Illuminating Engineering Society, and his loss will be widely regretted.

Illuminating Engineering Society in Germany

FOURTEENTH ANNUAL MEETING.

In this number a summary of some of the papers read at the 20th Convention of the Illuminating Engineering Society in the United States appears. Another event of the past month was the fourteenth Annual Meeting of the Illuminating Engineering Society in Germany, which took place in Essen during September 16th-19th. The proceedings follow lines very similar to those developed in this country and America. On the opening day, in addition to the usual reports of Committees, there was a series of papers dealing with various aspects of natural lighting. Hygienic and architectural aspects of access of daylight into buildings were presented respectively by Dr. A. Korff-Petersen, a medical man, and Herr K. H. Tischer, an architect. Herr Frühling dealt with the planning and calculation of daylight illumination, and Dr. H. Lux with problems involved in supplementing natural by artificial light. Various visits to objects of interest in the neighbourhood were arranged and a special visit was paid to the lighting exhibit at the Dusseldorf Exhibition, under the guidance of Dr. Teichmüller. We hope shortly to give an account of the various papers read.

Depreciation in Lighting Due to Dust

The interesting paper by Professor H. H. Higbee, dealt with in our last issue, showed very clearly the great depreciation that may occur in lighting installations if left uncleaned, especially those of an indirect character. Some further data on this subject are presented in an article by H. Lingenfelser, contributed to *Licht und Lampe*. The author shows the familiar curves connecting illumination and the number of weeks that have elapsed since lamps and fittings were cleaned. According to these data three weeks neglect would result in a loss in illumination of 10 per cent. for direct lighting installations, and nearly 40 per cent. for indirect lighting. Apparently the results for semi-indirect lighting were not much better than those for direct—possibly because open bowl fittings, notoriously subject to accumulation of dust, were used. The author goes a step further by analysing the cost of cleaning and the money value of the light lost. If these costs are plotted against the number of times the lamps and fittings are cleaned per year, one finds that the curves for value of light lost and cost of cleaning cross at the figure 30. The curve of combined cost, derived from the two items, therefore shows a minimum at this point. It would appear that the most economical conditions are obtained when lamps and fittings are cleaned 30 times per year—say every fortnight. This is about the interval which other investigators have suggested as desirable.

A King's Lighting Bill

To those who do not yet realize the opportunities for artificial lighting in Eastern countries, the account given in a Budget report of the finances of the late King Rama of Siam is illuminating. The deficit in his estate has been taken over by the Government of Siam, and the liabilities are estimated at £750,000. In a land where the sun does full duty each day and fogs are scarce, it is certainly surprising to find that the royal bill for electric lighting was £37,500 per annum, or more than £100 a day. We gather that some saving in this item is anticipated during the present year.

Football by Electric Light

In the daily press reference is made to the experience of the Middlesex Wanderers during their tour in Switzerland, when the sun disappeared behind the mountains a quarter of an hour before the finish of the match, and the ground was enveloped in darkness. The whole of the English party expected the game to be abandoned, but to their surprise, two large electric lamps with reflectors, attached to the top of the stand, were turned on, flooding the playing area with light. In the account before us it is suggested that this was an experience quite new to any English club. This is not quite correct. We believe that on several occasions football matches have been played in this country by artificial light, though this was done rather as an experiment. A football is a large object and the artificial lighting of a football ground, drawing a large "gate," should be an easier problem than the lighting of tennis courts, to which much attention has recently been given. The idea of using artificial light is worth attention in these days of crowded professional programmes, when games have frequently to be replayed after a tie, and fixtures during daylight hours may be difficult to arrange. It is also possible that the attendance might be greater than during the day, when even football "fans" have their occupations to pursue.

Advertising Home Lighting

A NOVEL ELECTRIC SIGNBOARD.

In a recent issue of *The Electrical World* there is an illustration of a highly novel electrically operated, animated billboard which has been put in operation on a much travelled thoroughfare in Salt Lake City (U.S.A.). This is one of the items in a campaign in favour of better home lighting, initiated by the Rocky Mountain Electrical Co-operative League, whose name appears in bold letters at the foot of the design. The board is of the "vista" or stage type, 10 feet by 30 feet, using three sets of coloured lights, so as to represent daylight, sunset and moonlight. The large picture contains a view of a house amidst wooded surroundings. As the sunset changes to moonlight the interior of the house appears to become lighted up, all the windows ultimately giving the effect of a brilliantly lighted interior in the moonlight.

Progress in Actino-Therapy Abroad

A glance at the most recent issue of *The British Journal of Actino-Therapy* shows the great progress that is being made abroad in the study of the treatment of diseases by light. There is now quite an extensive literature on this subject, and a number of specialized treatises have recently appeared in Germany. According to all accounts, Denmark has taken an exceptionally active interest in the treatment of tuberculosis by exposure to light, with the result that Denmark possesses one of the lowest death-rates in the world so far as this particular disease is concerned. Italy is also taking up the treatment with energy. Besides its natural advantages in the use of sunlight, institutions equipped with supplementary apparatus yielding artificial light are being developed. We notice a reference to the inauguration of the Photo-therapeutic Out-patients' Department for rickety children in Rome. It is stated that the work has been carried out and the machinery purchased by voluntary contributions from the entire staff of the Municipality—including wage-earners.

TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

Progress in Illuminating Engineering

A Review of Some Papers read at the Twentieth Anniversary Convention of the Illuminating Engineering Society (U.S.A.)

We are glad to have the opportunity of presenting, in this number, a summary of some of the chief papers read at the above Convention, which cover a wide range. It is impossible to deal adequately with all of this in the space available in a single issue, and we have therefore made a selection from those which have at present come to hand, leaving others for comment in subsequent numbers. Of those dealt with on this occasion special interest attaches to the following paper by Mr. A. J. Sweet, in view of the fact that the proceedings at the conference of the Institution of Public Lighting Engineers are also being recorded in this issue.

A Proposed Basis of Rating for Measuring the Qualities of Street Lighting Service

By ARTHUR J. SWEET

IN his paper on the above subject Mr. Sweet pointed out the problem of street lighting is a complex one, so that the determination of a satisfactory method of rating service is not easy. Adequate service is not merely a matter of providing an adequate total amount of light. Distribution not only with regard to different points along the roadway, but also the relative illuminations of horizontal and vertical surfaces is of importance. The *appearance* of a street when illuminated is often a deciding factor. Street intersections require brighter lighting than intermediate areas. Glare, which may vary from point to point, must also be taken into account.

It is also necessary to devise a basis of classification for streets. The author suggests that this may be done by means of three main divisions: *Streets for light traffic* (e.g., residence streets carrying only local traffic); *streets for medium traffic* (e.g., arterial streets other than trunk arteries in large cities); and *streets for heavy traffic* (e.g., trunk arteries of large cities). It is also to be noted that the *sidewalks* of such streets have different requirements, according to whether the streets are lined by houses, shops, theatres, etc.

Utilitarian Aspects and Appearance.—Two distinct considerations enter into any evaluation of the quality of street-lighting service—"utilitarian" and "appearance." The problem is not only to express these two items, but to devise a method of combining them. The most common way of doing this is by such a formula as $R=(R_1+R_2)/2$ where the mean of both quantities is taken. This assumes that both are equally important, but if not the formula may be modifications numerically in various ways. If either of the qualities is *essential*—so that the complete lack of it would render the lighting valueless, so that R should be zero, we might adopt the formula $R=\sqrt{R_1 \times R_2}$. If in the same circumstances one quality has twice the importance of the other the formula becomes $R=\sqrt[3]{R_1^2 \times R_2}$. The application of any of these methods might enable us to combine the quantities for utilitarian value and appearance for any particular street. The weight to be attached to these two items will naturally vary. In some streets such considerations as safety of traffic are dominant. But it has long been contended by certain engineers that "white way" ornamental street lighting should be judged chiefly in terms of appearance.

Main Objects of Street Lighting.—It is evident, however, that the determination of utilitarian quality alone is a complex problem. Pavements and roadway really constitute two different highways running side by side with different requirements. From the utilitarian standpoint street lighting is provided for the safety and convenience of the public, and seven distinct elements are to be noted, i.e., safety from collision, safety from attack, safety from burglary, convenience in recognition of details, convenience in avoiding stumbling, convenience in avoiding puddles, convenience of security. The original object of street lighting was to provide safety from attack; but to-day safety from collision has become the dominant consideration. Convenience in recognizing objects, e.g., the faces of passers-by or details of an automobile ahead, are by no means of negligible importance. Safety from collision, safety from attack, and convenience in recognition of objects may be regarded as the three major utilitarian purposes of street lighting. On the sideway, safety from collision, the most important item in the roadway, is probably of less consequence than the two other factors.

Methods of Recognizing Objects.—Recognition of of objects or discernment is effected in various ways, e.g., by illumination, shadow, silhouette, or "glint."

If objects could be discerned entirely by illumination we should have conditions comparable with those existing in full daylight. Objects are, however, in part recognized by their shadows, by being seen silhouetted against other and brighter surfaces, such as the roadway, or by the aid of reflection of light from wet roads, puddles, etc. ("glint"). In rating street lighting considerable importance has been attached to the illumination provided. Yet, in fact, adequacy cannot be measured entirely in terms of this quantity, and the importance to be attached to other elements mentioned above will vary according to the illumination provided. As a very faint illumination is provided the utilitarian value at first increases slowly from zero. When illumination of the order of full moonlight is approached (0·025 foot-candles) the practical utility increases rapidly. At this intensity the features of pedestrians can be recognized at close range. With still higher illuminations the practical utility, whilst still increasing, does so less rapidly. At a relatively low intensity, say 0·10 foot-

candles for residence streets carrying local traffic only, the practical utility has reached a value not far short of 100 per cent. The choice of full moonlight as a key value is not entirely arbitrary, as the eye may be assumed to have developed so as to possess a moderate power of discernment at this intensity. Based on these considerations, the author, in the original paper, derives a diagram showing the curve between practical utility and illumination. This curve remains constant in shape for different types of streets, but the scale of the illumination is varied. It is assumed, for example, that the requirements of medium traffic call for four times as bright an illumination as is necessary for light traffic streets, in order to produce the same class of service.

Basis of Illumination Measurements.—On the sidewalk recognition of passers-by is the most important element in providing for safety from attack. Hence the level at which illumination should be measured is about five feet. For the roadway three feet in height is more representative.

A sound system of rating must take due regard to uniformity of illumination, and should be based on both average and minimum illumination values. Any system depending entirely on one of these quantities only may prove unduly favourable to some systems and too hard on others. In rating surface brightness one obvious difficulty is the extent to which such data are affected by weather conditions, besides the characteristics of the surface illuminated (asphalt, macadam, concrete, wood, or stone block, etc.). It is suggested that the difficulty might be met by making two determinations of surface brightness, one with a diffusing test plate of known coefficient of reflection, the other with a specular test plate of known coefficient of reflection. The interpretation of results would, however, require specialized knowledge and skill.

Determination of Glare.—The determination of glare also involves many different factors. Where spacings do not exceed ten times the mounting height no material error is evolved in regarding glare as having a constant value at all points along the street. The incomplete data available to-day suggest that a relationship between physical conditions and blinding glare can be established, and the glare factor computed with sufficient practical accuracy from the photometric curve of the lighting unit, the mounting height and the average spacing value.

Practical Procedure in Evaluating Utilitarian Service.—It is suggested that the practical procedure in dealing with a street should be as follows:—

(1) Select a suitable length of street, not less than the distance between the centre line of one intersecting street to the centre line of the next, nor less than from one light unit to the next lighting unit.

(2) Divide the entire roadway surface under test into equal areas 10 feet square, and adopt points at the centres of each square as stations for measurement. Corresponding stations, in line with those on the roadway, to be adopted along the centre line of the sidewalk.

(3) At each roadway test station determine (*a*) illumination in a vertical plane perpendicular to length of street, at a height of three feet above road surface; (*b*) illumination on a plane parallel to road surface and not more than six inches above roadway, measured from the direction in which traffic flows at an angle of 2° with the surface and parallel with the axis of the street.

At each sidewalk test station determine (*a*) illumination in a plane perpendicular to axis of street, on both sides of the vertical plane, at a height of five feet above the sidewalk surface; (*b*) surface brightness on a plane parallel to sidewalk surface, and not more than six inches above it, measured from both directions of traffic at an angle of 5° with the surface and parallel with the axis of the street.

(4) From the photometric curve of the lighting unit, the mounting height and the spacing value derive the glare-correcting factor. Reduce the illumination for each roadway test station to the equivalent value for glareless illumination. Translate these illumination values into coefficient of service values. (Graphs for this purpose are furnished in the original paper.) Average these values, thus obtaining the coefficient-measuring quality of service with respect to discernment by illumination for the roadway. By a parallel procedure determine quality of service for the sidewalk.

(5) For the areas at street intersections roadway-brightness readings must be averaged. To values so obtained glare-correction factors must be applied and the average results covered into a coefficient-measuring quality of service in terms of discernment by silhouette.

(6) For the roadway, and for the sidewalk the coefficients of discernment by illumination and discernment by silhouette must be combined (by means of graphs given in the original paper), thus obtaining the coefficient of utilitarian service in both cases.

(7) Finally, the coefficients of utilitarian service for the roadway and the sidewalk are combined together, thus enabling the coefficient of utilitarian service for the road as a whole to be obtained.

Evaluation of "Appearance."—We come next to the method of determining the "appearance quality" of a system of street lighting. Here personal taste enters, and the process is vastly more difficult. It is necessary to draw a distinction between public taste and the taste of trained experts. Public taste changes from decade to decade. The author has again and again been told that public taste demanded this or that. But such interpretations of public taste by different people vary greatly, and really express the opinion of the person making them. Any appeal to public taste must be a true referendum, not a mere individual interpretation.

If, on the other hand, standards of appearance are to be derived from a consensus of trained taste, this trained taste must be worthy of the name. Competent interpretation can only be made by a group representing pre-eminent standing in such fields as architecture, painting, or the like, and by them only after making the problem the subject of serious study.

Whether public or trained taste be appealed to, certain difficulties present themselves. The relative *order* of excellence of various installations might be decided. But it is quite another matter to establish *degree* of excellence, in numerical terms. A further difficulty is that this quality involves brightness of illumination. A system of higher merit, so far as appearance is concerned, might be placed lower than another in which larger lamps are installed. Hence comparisons of appearance ought to be made on the basis of identical intensity of illumination, or, better still, on the basis of identical annual cost of street lighting. The appearance factor both by night and by day must be considered, and the two judgments combined; the author suggests that appearance by day should be assigned twice the importance of appearance at night. In conclusion, the author believes that at present exact æsthetic evaluation in numerical terms is impracticable. But he believes it possible that, on the basis of agreed principles, installations might be arranged in order as regards appearance.

Lighting and Contrast

An instructive series of experiments recorded by Professor P. W. Cobb and F. K. Moss showed the important part played by "contrast" in facilitating visual operations. Except for the contrast between it and its surroundings an object would be invisible. It is evident therefore that this factor deserves careful consideration in lighting systems and that the mere provision of a certain foot-candle intensity does not alone ensure that the lighting is adequate for the purpose in view.

The experiments were designed to test several different problems. Experiments were made to determine the relations between size of object, its contrast and the intensity of illumination. These results were assembled in tabular form. The effect of contrast is very apparent. Thus an object 3 mm. in size, with a contrast of 100:4 and exposed for 0·05 second, would be approximately equivalent to an object of similar size, with a contrast

of 100:73, but an exposure time of 0·2 second. The percentage of brightness necessary for visibility also rises rapidly as the object becomes smaller.

Another point of great practical importance is the effect of bright and dark areas in the visual field. Where critical vision is required the working field of vision is small compared with the whole extent of the visible surroundings. Within this comparatively small area the *effectiveness* of the illumination varies widely, depending on the distribution of light. An experiment was performed in which the eyes were required to shift back and forth from a test object located in a uniformly illuminated area to another object placed in a field of comparatively low brightness. The actual task consisted of the examination of two typewritten sheets, 8 inches apart, and thus resembled closely operations in office work. Means were provided whereby a shadow could be cast on one of the areas. The results here were particularly instructive. A reduction from 20 to 1 millilamberts is great enough to produce significant changes in the performance of the worker. Under the alternating condition of 20 and 1 millilamberts, even less work was accomplished than with the low uniform brightness of 1 millilambert, although the average brightness was 10·5 millilamberts! This shows very clearly the importance of diversity factor. An average struck between values of illumination that are widely apart may be vastly inferior for effectiveness to the same illumination when uniform. In the words of the authors "an abundance of light improperly placed, even though not glaring, is a handicap to vision. The twenty millilamberts brightness resulting from 20 foot-candles illumination or more may be a distinct handicap to the eye which is compelled to work in and out of a 25 per cent. shadows."

Another important point in industrial lighting is the relation of the brightness of the immediate working field to that of surroundings. High-intensity illumination is most desirable in increasing production and improving the quality of the work, but it is not necessary that the intensity used on critical work be maintained throughout the installation. It has been proved that the brightness of objects of fields considerably removed from the working field in visual angle have little effect upon vision. Experiments here recorded show that there was no sensible change in speed of vision between the conditions of light and dark surroundings more than $2\frac{1}{2}^\circ$ to 3° removed from the centre of vision. But when a much smaller intermediate field was used the results were otherwise. With a working field subtending an angle of $\frac{3}{4}^\circ$ to 1° from the centre of vision, it was found that results were 10 to 15 per cent. better with light surroundings than with the dark.

The experiments lead to the conclusion that when the immediate field is of small dimensions (1° to 2° from the visual line) very dark surroundings are undesirable and will lead to a decrease in production. When, however, the immediate field is of great extent (3° or more) the factor of contrast becomes of negligible importance as regards production, though great extremes in contrast may be discouraged for other reasons.

An Investigation of the Reliability of the "li" Test of Visual Fatigue

As many of our readers are doubtless aware, efforts have been made in the United States to establish the effect of various lighting systems in causing visual fatigue, by means of a method based on the observation of a test object placed at a given distance from the eyes, the ratio of the time during which this object appears respectively "blurred" and "clear" being adopted as an indication of fatigue. This method of testing has now been subjected to an exhaustive analysis by Mr. M. Luckiesh, Professor P. W. Cobb, and Mr. F. K. Moss. The test object consisted of the letters "li" in eight-point lower-case type, printed upon a white card, situated at rather less than the maximum distance at which the critical detail of the object could just be made out. The subject was asked to record, by the pressure of a telegraphic key, when the letters appeared respectively clear to blurred and the ratio time clear/time blurred was noted. In order that such a test should furnish a satisfactory method of estimating visual fatigue with different lighting systems it is essential that this ratio should remain substantially constant under given conditions.

In the experience of the authors this was not the case. The value of the ratio often varied widely from day to day for the same distance of the test card. It is concluded from these data, representing 329 three-minute tests, that this method of evaluating lighting systems "cannot be justified even as a rough approximation."

Intensity of Light and Speed of Vision Studied with Special Reference to Industrial Situations

This series of experiments, by C. E. Ferree and G. Rand, was designed to show the variety of factors that influence tests of the relation between illumination and speed of vision. Probably the most important of these factors are size of object and reflecting power of background. Many of the curves accompanying the article show increasing speed of vision with rising illumination. In general the large effects occur in the lower part of the intensity scale. The smaller the work and the smaller the difference in reflecting power of object and background the greater is the effect of higher illuminations and the greater the range over which an important benefit may be expected from increase in intensity.

The point below which a 5 per cent. increase in illumination gives more, and above which it gives less, than a 5 per cent. increase in speed of vision, varies widely with the nature of the object and background; this "critical point" shifts rapidly as these two elements are altered.

Speed of discrimination and its range of change with increased intensity of illumination are also affected by changes in the diameter of the pupil—which itself reacts rapidly to changes in illumination. The size of the pupil may, however, be affected by other factors besides the size and brightness of the illuminated area.

Daylight Illumination

Problems in connection with Daylight Illumination were dealt with in four separate papers. Mr. A. F. Beal in his contribution entitled "Some Factors affecting Daylight Lighting of Interiors" records about 50,000 measurements made by the United States Public Health Service in a school building in Maryland during 1923-24. The data are applied chiefly to illustrate the great variations in illumination caused by the influence of clouds. The effect naturally depends on the nature of the clouds (e.g., whether thin or heavy), but the author finds that in general there is an increase in illumination as the clouds increase, until about half the sky is covered; after that stage light clouds cause little further change in indoor illumination, but a further increase in thick clouds may reduce it materially. As a rule 80 per cent. of the illumination obtained from a cloudless sky is still obtained until more than 8/10ths of the sky is covered by thick clouds. The daylight factor is found to vary considerably according to the condition of the sky, the season, time of day, etc. As the area of sky covered by thick clouds increases, the indoor illumination tends to decrease, but the daylight factor increases. On the other hand, the ratio between indoor illumination and sky-brightness decreases, and this leads the author to suggest that this quantity may be preferable to the daylight factor in respect of constancy.

Mr. H. H. Higbee's paper was devoted mainly to the control of *daylight illumination by means of blinds*, and a considerable number of diagrams illustrating their effect on the conditions of illumination in schoolrooms is presented. A number of useful conclusions emerge. In view of the valuable nature of light derived from the upper parts of windows, it is desirable not to cover this upper area by blinds, which are preferably applied to the lower sections of the window space. The author also recommends the use of venetian blinds, as by suitable attention to the finish and angle of slats these may be applied to improve the distribution of light.

Messrs. E. H. Hobbie and W. F. Little study the *Transmission of Light through Window Glass* of various kinds. Tests can be simplified and rendered less costly by the use of models. Seven chief types of ribbed or prismatic glass are illustrated, and numerous diagrams are presented showing the distribution of light from each. The choice of glass depends on various circumstances. Some forms are best adapted to winter conditions, others operate best with the sun at a low altitude, etc. On the whole, No. 2 (a variety known as " Factrolite ") appears to give the best average results.

The final paper in this section, by Mr. W .C. Randall and Mr. A. J. Martin, deals with the *effect of dust on window glass*. Diagrams illustrate the decline in transmission with time when windows are left uncleaned. Thus 120 days' neglect caused the original transmission of 80 per cent. to be reduced very greatly—the ultimate transmission in some cases being as low as 15 per cent. Another diagram illustrates how transmission diminishes with the increase in slope from the vertical, owing to deposition of dirt. A somewhat unexpected conclusion is that three-quarters of the dirt on windows is deposited on the *inside*—external dirt being presumably largely removed by rain, wind, etc. A considerable improvement in transmission may therefore be secured by cleaning the inside of windows alone (which is usually cheaper and easier) at shorter periods than is customary for entire cleaning. If windows are cleaned only once a year, the process should take place in the autumn, so as to be relatively clean during the winter, when daylight is at a minimum.

Light in Medicine and Surgery

Dr. HERMAN GOODMAN commenced his paper on the above subject by recalling that the oath the medical graduate takes is known to this day as the " Oath of Hippocrates." Hippocrates, the Father of Modern Medicine, knew the value of sunlight, and it was used by Herodotus, Pliny, and others in the Old World, and by the natives of South and Central America in the New. Reference is made to various early workers in this field, and especially to Finsen, the inventor of the Finsen light, who received the Nobel Prize in 1903. Later, Rollier in Leysin, Henry Gauvain in England, and many others have studied the healing power of sunlight. Huldschinsky, in 1918, is credited with the earliest work on the use of artificial light for the cure of rickets. Dr. Goodman next reviewed the chief light sources available for the doctor, mentioning, amongst artificial sources, the quartz mercury-vapour lamp and various forms of arcs. The former lamp loses some of its power with age; according to Coblentz, after 1,000 hours the ultra-violet intensity is reduced to one-half. Incandescent lamps act practically as heating agents, but some authorities advocate a mixture of infra-red and ultra-violet rays. The resister metal " globar " is now considered as a material for the electrodes of medical arc lamps. In England tungsten is very popular as a material for electrodes, but there is little experience of its use in the United States. Dr. Goodman presents a table showing the depth of epidermis that can be penetrated by ultra-violet rays of different wavelengths. The fact that rays even from tungsten arcs are absorbed by 1·5 mm. of freshly cut skin suggests that " penetration " is the wrong word to use in connection with such rays, and that their properties should preferably be attributed to some transmuting or transforming effect. In human therapeutics the zone of long and middle ultra-violet has been found of greatest value. The zone of ultra-violet in sunlight ends at 2900 A.U., and it seems, therefore, wise to rely chiefly on radiation of wavelength longer than this.

Dr. Goodman urges the need for honesty and discrimination by sellers of lamps. " It certainly is not fair or honest to sell a doctor a light source with its lowest limit in the visible zone and quote Finsen." Doctors are not always familiar with the physical side; here the illuminating engineer can help them.

Dr. Goodman also emphasizes the need for care in applying the new forms of radiation, and in selecting patients likely to benefit from it. Some patients are so highly sensitive to sun exposure, or its counterpart in artificial light, that it may have permanent or even fatal reactions. The eyes of patients and operators should be protected. Not only should sources of ultra-violet be guarded against, but powerful sources of visible illumination. The time element must be considered. A patient needs to be exposed for long periods rather than for minutes. The period of exposure cannot be shortened indefinitely by using more lamps. Can light therapy be overdone? Is there a limit beyond which the organism cannot absorb? The indications are that such saturation points exist. Are all the effects, as we believe they exist, in light transferable through radiation of certain otherwise inactive substances?

There is plenty of room for improvement in our knowledge. The illuminating engineer will be of great aid to the progress of photo-therapy by producing such sources of artificial light as will produce the counterpart of sunlight on a scale commensurate with our limitations.

Art and Utility in Church Lighting

In a paper on this subject, Mr. J. L. STAIR reviewed methods of lighting in different types of churches, pointing out how this needed to be adapted to the special form of religious service. It has been pointed out that lighting equipment for churches furnishes one of the very rare cases in which we have no mediæval precedent to draw upon. This may partly explain why many churches are poorly lighted. The recent installations in the cathedrals at Peterborough, Canterbury, and Llandaff, in the British Isles, are mentioned as indications of the desire to introduce appropriate modern methods in old surroundings; the Peterborough Cathedral, 800 years old, represents one of the first attempts to illuminate any of these mediæval structures. Barcelona Cathedral has been instanced by Mr. R. A. Cram as probably the darkest church in the world. Church lighting requires the co-operation of the architect in a special degree, and the lighting specialist will find it to his advantage to study carefully the traditions of the church to be treated, and to have a working knowledge of the various architectural styles.

In the next section of the paper Mr. Stair recognized three main considerations in church lighting—utility, artistic effect, and the comfort of the eye.

Utilitarian aspects include the following: Sufficient illumination for reading; adequate wiring facilities and capacity; economy of operation; reasonable cost consistent with good design; simplicity and convenience; efficiency of light utilization; flexibility of switching and dimming; provision for easy maintenance; outlets for stereopticon lantern; exits and emergency lighting; lights for the speaker.

Flexibility in switching is of considerable importance. In many cases a low intensity is required for certain parts of the service, while on special occasions additional lighting is desired. Dimmers are coming into general use. This may appear at first a theatrical development, but it is a manifest advantage that changes in brightness of lighting should be made unobtrusively and not suddenly.

Æsthetic aspects involve: Symbolic features, as influenced by the particular creed; decorative or artistic lighting arrangements; simplicity and harmony in design of fittings; effect of the lighting on architectural treatment; colour harmonies; shadows; appropriate and dignified effect; atmosphere and psychological effect on the audience; lighting refinements. (The use of coloured light in churches must, however, be undertaken with great caution.)

Hygienic aspects include: Freedom from glare and strong contrasts; low brightness of lighting units; eye comfort; diffusion; shading of light sources for eye protection; relief by restful points of light.

In the remainder of the paper illustrations of a variety of lighting installations are presented. One of the most effective of these is the concealed lighting of the altar and sanctuary at the Oestermalmskyrkan, Stockholm. Many examples of indirect lighting are included, one of the most original being the lighting of a church by units concealed from view in the ledges of the windows. There are also several examples of spectacular exterior

lighting, such as the floodlighting of a church with a bright luminous cross visible above the tower, and the floodlighting of the slender spire of the First M.E. Church, Chicago. Attention is drawn to the opportunities for good lighting in various subsidiary buildings such as schoolrooms, social rooms, etc., frequently attached to churches.

Lighting the Sesqui-Centennial Internation Exposition at Philadelphia

This installation, described by Mr. D. W. ATWATER, has recently been mentioned in *The Illuminating Engineer*. A main feature was the general use of concealed and floodlighting and the use of colour, for example in the illumination of the City Hall tower and in the treatment of the "tower of light" within the grounds of the exhibition. An illustration is presented of the replica of the famous Liberty Bell, erected at the entrance to the exhibition, which was also flooded with light and formed a conspicuous feature. The historic old Independence Hall was, however, treated with restraint, the lighting being as unobtrusive as possible and colour effects omitted.

Under-Water Illumination

Messrs. S. G. HIBBEN and W. A. MACKAY reviewed methods of providing "under-water illumination," for instance in diving operations and for the marking-out of channels. The lighting of swimming pools also presents an interesting problem. Great progress has been made in the design of waterproof fittings. Both wide and narrow beams have been employed, but in either case units should not be set in the bottom pointing upwards —an arrangement that merely gives rise to glare. For disclosing objects below the surface the lighting units must be immersed, but should be mounted at the sides and the beam directed away from the observer. Such methods may add greatly to the effectiveness of swimming and diving displays by night.

Experiments made in 1925 disclosed the fact that the bulb of a lamp immersed in water may be reduced to half the size customary for a given power, and that a concentrating type of reflector is desirable if any great degree of penetration is to be attempted. A single bare 1,000-watt gasfilled lamp will provide a diffused illumination that discloses an object clearly at a distance of five to ten feet. The same wattage in a concentrated filament lamp equipped with reflector will enable a human body to be seen at a distance of 50 to 100 feet. In all deep-sea operations daylight is of little value. Divers find that they obtain little aid from sunlight at depths of 50 feet or more, and below 100 feet it is difficult to distinguish between night and day.

In the photography of the ocean bed effective use has been made of the "smoke-stack" of a vessel, that provides a passage-way from the surface to a depth of 50 feet. A heavy plate-glass window at the lower end, coupled with the projection of light on surrounding objects, has enabled useful information to be obtained in shallow water. In 1925 a pressure-resisting lamp housing was developed in the Leavitt salvaging operations, off the coast of Chile. This was used at depths of 300 feet, but owing to the glare the diffused illumination was more confusing that helpful. Hence light sources were concealed in concentrating reflectors, and a 1,000-watt unit of this nature, capable of being held in the hand and suitable for deep-water operations, was developed. These portable units proved invaluable in assisting operations on the ill-fated submarine S.51. The latest model of diving lamp consists of a concentrated tungsten filament in a 5-in. diameter bulb, ordinarily operating at 1,000 watts on 115 volts. The bulb is of specially hard glass, capable of withstanding pressures to any depth that divers have attained, namely, about 300 feet. These lamps are built to operate at a high efficiency, about 25 lumens per watt, when the rated voltage is applied. However, this condition is seldom realized owing to the voltage drop in the long cable. There is no practical limit to the strength of the glass lamp-bulb in regard to resistance to pressure. It is quite within the bounds of possibility that these lamps may be lowered to 1,000 feet or more, and thus employed in obtaining deep-sea photographs far below the present range of diving operations. Cameras are being developed for this purpose, and there will soon be given to the public many views of a hitherto unknown world.

(To be continued.)

Some Impressions of Lighting Conditions in London

A CONTRIBUTOR to *Licht und Lampe* gives his impressions of lighting in England, and especially London, which he recently visited. He remarks that the impression on landing at Harwich is a somewhat sombre one, but he was agreeably impressed by the thorough yet courteous manner in which passports were examined, and by the spacious Pullman car in which the journey to London was made. The corridor carriages were electrically lighted throughout, and the distribution of light appeared good, the combination of semi-indirect ceiling lamps and wall fittings enabling persons to receive illumination from all directions. So far as the journey from London to Harwich is concerned, the lighting of stations appeared, as in Germany, very variable. In the main incandescent gas lighting is used, and in the smaller stations oil lighting is still to be found. Liverpool Street Station he describes as a dark and cheerless place, but he was agreeably struck by the convenience of an ample supply of taxis adjacent to the arrival platform.

So far as his somewhat limited opportunities enabled him to judge, he rather doubted whether the lighting of London as a whole would bear comparison with large German cities. Yet the lighting of the City of London, with its large number of relatively narrow streets, struck him favourably. He alludes with approval to the good lighting furnished by the centrally suspended lamps. Like most foreigners, he wonders at the mixture of lighting to be found in many London Streets. So far as gas lighting is concerned, London seems to be somewhat in advance of many German cities. The four-burner inverted gas lamps only recently introduced in Berlin in a single square are widely used in London, and likewise low-pressure burners carrying 10 to 15 burners.

One learns with interest, however, that the display of illuminated signs in central London "would cause much nervous apprehension amongst the Berlin police in control of traffic." In general, too many individual displays are crowded into a given space. In Leicester Square and adjacent areas the effect of individual signs must be largely lost owing to the multiplicity of devices.

For interior lighting gas is mainly used in the suburbs, electricity in the centre of London. One point of interest is the general use of enclosing glassware, for instance that of the Holophane type, in place of the reflectors which are usual in Germany. As regards the use of light, there is still much to criticize, especially in methods of shop-window lighting (at present the subject of an intensive campaign in Germany). Glare from unscreened clear-bulb lamps in windows is frequent. In shops and hotels, even of a first-class character, the existence of unsatisfactory lighting conditions show that illumination has not yet received the recognition it deserves.

Nevertheless it is admitted that in many respects the conditions in England are very similar to those in Germany. As in that country, attention is continually being drawn to the need for better methods of lighting in the technical press. Many of the showrooms of the leading firms contain an excellent display of all the latest lamps and lighting appliances. In both countries the need for education in the fundamental principles of good lighting of those responsible for installations is evident. It is to be expected that the projected plans for the development of electrical supply in England will lead to a general improvement in matters of lighting.

Daylight Illumination

(A Summary of Papers read at the 14th Annual Meeting of the Illuminating Engineering Society in Germany)

AS mentioned elsewhere (see page 282), a series of four papers dealing with daylight illumination was read at the annual meeting of the German Illuminating Engineering Society, held in Essen last month.

Hygienic Aspects.

The first paper, by Dr. Korff-Petersen, dealt with hygienic aspects. It is true that the effect of light on the body, which in the open air is very considerable, is apt to be exaggerated indoors. Nevertheless, a generous access of daylight into interiors is highly necessary. Its influence on the spirits should not be overlooked, especially in the case of children. Moreover, abundant light has indirectly a hygienic influence in promoting cleanliness.

In the case of daylight illumination, the actual minimum illumination necessary is difficult to specify. The same illumination in the same room may in some circumstances produce a cheerful effect, and in others the reverse. But in all rooms certain places must be set apart for fine work, and for these adequate illumination must be provided. In dwelling-rooms, however, it is chiefly the general illumination with which we are concerned. A starting point for calculations is afforded by the Kuster formula, according to which at least a third, and preferably half, the floor space should be open to light derived direct from the sky. In hospitals access of daylight is equally important. The regulations of the Ministry of Health (Volkswohlfahrt), issued in 1920, contain specific requirements on the design and construction of such buildings, but in many respects are capable of improvement.

In schools and workrooms the requirements of the eye assume special importance. In schools the rules devised by Cohn have been widely followed, though to-day they are regarded as being insufficient so far as illumination is concerned. It is a question whether these requirements should not now be revised; certainly they should never be disregarded.

In all workrooms the illumination of the worst-lighted place should be studied. The average illumination is only a guide in so far as the minimum illumination can be deduced from it. In fixing this minimum illumination consideration must, however, be paid to the conflicting claims of lighting and heating. The provision of adequate daylight illumination has thus a profound influence on the art of building, town-planning, etc.

Architectural and Building Requirements.

This aspect of the subject was treated by K. H. Tischer, an architect, who, in his opening remarks, emphasized the importance of open surroundings and freedom from obstruction, on which the access of light into buildings ultimately depends. The degree of obstruction depends primarily on the height and distance of adjacent structures to which careful attention must be given by architects in making their plans. The desire of an owner to make the utmost use of his ground story has always to be borne in mind. Provision of adequate access of daylight is customarily guarded by regulations affecting the height and distance of buildings from each other. Supplementary special rules and methods of measurement have also been applied, for example the Kuster formula referred to above.

Next in importance is the provision of adequate window space for individual rooms. Modern methods of building construction are based on the desire to extend the available window space to its utmost limits, and to eliminate all obstructions which impair the efficiency of windows. Finally, it must be remembered that the amount of light reflected from walls and ceilings has a material effect on the illumination, and that the degree of uniformity attained depends on this factor to a great extent.

A Basis for Calculation of Daylight Illumination in Interiors.

Under this heading H. Frühling describes some experiments on the natural lighting of interiors made by the Illuminating Engineering Department of the Osram G.m.b.H; at the instigation of Dr. L. Bloch. These experiments led to the conclusion that the useful flux of light (average illumination × floor area) in general amounted to about 40 per cent. of the flux of light transmitted through the window. The utilization efficiency thus determined is about the same as in the case of artificial lighting. In addition, the ratio of the vertical illumination of the window to the unrestricted horizontal illumination out of doors was ascertained under various conditions, e.g., in relation to the height of adjacent buildings facing the window. The "window factor" thus determined, in conjunction with the utilization efficiency for the room, enables the average interior illumination corresponding with a certain external horizontal illumination to be determined approximately by various simple formulæ. Naturally, the actual outdoor daylight illumination is subject to wide variations according to the condition of the sky, etc., and it is, therefore, necessary to assume a standard value corresponding with sufficient indoor illumination under normal conditions. For this standard value 3,000 lux might be assumed.

Measurements of distribution of light in rooms showed that the uniformity is very much less than is usual with artificial lighting. The diversity coefficient (ratio of minimum to maximum horizontal illumination) may be as great as 100:1 or more. Uniformity is materially affected by ratio of window light to depth of room, height of window above floor, ratio of window space to floor area, and the "window factor."

The mean illumination defines sufficiently well the manner in which the working area, situated mainly in the centre of the room, is lighted. Yet, in view of the want of uniformity of daylight illumination, mean horizontal illumination does not suffice as an indication of the way in which the room as a whole is lighted, and a knowledge of the diversity factor is of considerable importance. Measurements showed that in general minimum illumination varied from 2 to 15 per cent. of the average illumination. It is hoped that the data will be useful to architects in enabling them to make an approximate predetermination of the conditions of illumination as a supplement to compliance with existing building regulations.

Artificial Light as a Substitute or Supplement to Daylight.

In his paper on the above subject Dr. H. Lux referred to the widespread opinion that a mixture of natural and artificial light is wearisome to the eye, and that therefore complete replacement by artificial light is desirable. This view can, however, only be justified when the artificial illumination is sufficiently high, and when the conditions as regards direction of light and shadows are substantially similar to those characteristic of daylight.

The average illumination on a horizontal surface one metre high does not usually exceed 50 lux in offices and factories. The average vertical illumination, to which insufficient consideration is often given, may be much less. On the other hand, with good daylight, one can depend on 100 to 250 lux in modern rooms, both as regards horizontal and vertical illumination. Experiments have shown that in the interval between 25 and 250 lux a material improvement in efficiency of work occurs, in so far as processes depending on clear vision are concerned. It is, therefore, clear that the efficiency must fall materially when artificial sunlight is substituted for daylight, owing to the diminution in illumination; whereas with a mixture of natural and artificial light this diminution does not occur.

It is, however, also necessary to bear in mind the difference in the quality of the illumination. With daylight the illumination is derived from relatively large luminous surfaces, such as the windows, and the brightly lighted surfaces of walls and ceiling. We have, therefore, a good distribution of brightness and good conditions as regards shadow. Moreover, the eye is adapted organically to the colour of daylight.

By artificial light, on the other hand, we have to deal with small sources of light, giving sharp shadows, considerable variations in the direction of light, and a substantial departure from the colour of daylight—all factors that influence clearness of vision.

Our object should therefore be to render conditions of artificial lighting comparable with those enjoyed by daylight. Methods which aid us in this direction are the use of semi-indirect units having a substantial indirect component, the arrangement of relatively extensive sources in the vicinity of the window-wall; with very deep rooms the grading of parallel rows of lights, the candle-power of which should be strengthened as we depart from the window; substantial increase in the illumination; an approximation to the colour of daylight.

This applies to the complete substitution of artificial light for daylight, and still more to the use of artificial light as a substitute or supplement to daylight. With increasing darkness the switching on of individual lamps should pass unperceived; no adaptation of the eye to alterations in lighting conditions should be necessary; both the intensity and the quality of the light should be maintained constant. Hence in mixed lighting the use of artificial daylight is to be recommended. Compliance with these requirements naturally involves a considerable increase in cost, owing to the increase in the power of lamps used. But it must be remembered that some time is necessary for the eye to adapt itself to a lower order of illumination after the substitution of artificial light, and that during this period the efficiency of work suffers.

Right of Light Disputes

A useful article in *The Manchester Guardian* reviews the progress that has been made of recent years in methods of determining when compensation for loss of daylight through erection of neighbouring buildings is justifiable. The basis of legal action in England and Scotland differs somewhat, but large sums in compensation are frequently paid. Until the advent of recognition of scientific methods, based on daylight photometry, decisions were extremely difficult, and the inferences drawn by expert witnesses of plaintiffs and defendants regarding the effect of obstructions were often poles asunder. One of the earliest cases in which the more scientific methods proved triumphant was that of Semon *v.* the Bradford Corporation, shortly after the war. By the new methods it is possible by geometrical means to ascertain the effect of obstructions before a brick has been laid; in a recent case in Liverpool the matter was considered and compensation agreed upon before the new buildings were begun. From diagrams, showing the amount of sky visible from a window-area of certain size, the daylight factor at a certain point in the room, and the available horizontal illumination under specified conditions of sky-brightness can be predicted with very fair accuracy. Such methods have been fully described in recent papers before the Illuminating Engineering Society, the Royal Institute of British Architects, the Surveyors' Institution, etc.

Institution of Fuel Economy Engineers

We understand that the Rt. Hon. Sir Alfred Mond, Bart., who recently accepted the chairmanship of the new National Fuel and Power Committee, appointed by the Government in accordance with the recommendation of the Coal Commission, has also accepted an invitation to become the first President of the Institution of Fuel Economy Engineers. The first meeting of the 1926 winter session of the Institution will be held in the House of the Royal Society of Arts on September 24th, when a paper will be read by Dr. A. E. Dunstany (Chief Chemist to the Anglo-Persian Oil Co.), on "Liquid Fuels."

An Accident Due to Inadequate Light

We notice in *Truth* a reference to a verdict of "Accidental Death" recently recorded at South Shields at an inquest on a labourer who fell 17 feet whilst working below the deck of a steamer. In this connection *Truth* remarks:—

> "The Coroner found that the accident was due to insufficient lighting, the man having had only a candle while doing his job. It seems surprising that in these days a man working on a ladder or some such unstable perch in a dark hole should be provided with no better light, but I gather that a candle is the usual illuminant for jobs like this. The Coroner pointed out that the case did not come within the scope of the Factory Acts, and urged factory inspectors to press for a clause in the new Bill which would include such cases. I should have thought the Board of Trade need not have waited for a fatal accident before dealing with an out-of-date practice with such obvious danger attached to it."

The incident illustrates the importance of the clause embodied in the new Factories Bill, referred to in our last issue. No doubt the new Act, when introduced, will make it easier to deal with such cases as this, though it should not be assumed that the Factory Department does not realize the importance of good lighting. On the contrary, as readers are aware, it has done a great deal during recent years to educate employers on this point. This particular form of accident is specially liable to be caused by bad lighting, as was illustrated by the familiar data collected by the Departmental Committee on Lighting in Factories and Workshops, and presented in their first report in 1915.

The Rapid Determination of Average Illumination in Street Lighting

A useful little article on the above subject is contributed to *The Revue Générale de l'Electricité* by Mons. M. Coru, who is in charge of the experimental department of the Société pour la Perfectionnément de l'Eclairage. After defining the coefficient of utilization as the ratio between the flux of light reaching the roadway and pavement to the total flux furnished by the sources, he proceeds to show how the coefficient may be determined in different zones. Finally a diagram is presented giving values of the coefficient of utilization, a separate graph being presented for each angular zone. It is remarked that the coefficient of utilization is always less than 0·5. Once the total flux reaching the road surface is determined one has only to divide the flux by the surface area considered in order to obtain the average illumination.

British Standard Specification for Brazing Solder (Grades A and B)

The British Engineering Standards Association has now issued a Specification (No. 263-1926) covering two grades of brazing solder. The copper contents for the two grades range from 53 to 55 per cent. and from 49 to 51 per cent. respectively, maximum limits being specified for the tin, antimony, arsenic, bismuth, iron and lead permitted in the alloy. A table is included as an appendix to the Specification giving a range of grain sizes of granular solder to which it is recommended that the material be ordered.

Copies of this publication may be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, price 1s. 2d., post free.

Proceedings at the Third Annual Meeting and Conference of the Institution of Public Lighting Engineers

Held in Newcastle-upon-Tyne during September 14th-16th, 1926

IN our last issue we presented the programme of the annual meeting of the Institution of Public Lighting Engineers,* which was held in Newcastle last month. We now propose to give an account of the proceedings and summaries of the chief papers read.

The Presidential Address.

The first item on the programme was the Presidential Address delivered by Mr. R. Davison (Superintendent of Lighting, City and County of Newcastle-upon-Tyne). In his opening remarks Mr. Davison pointed out that whilst considerable advances had been made in many public services, street lighting remains practically where it was in 1914. This position is due partly to the war, but also to the fact that authorities do not fully realize the benefits which adequate street lighting can give to the nation. As lighting officials they looked forward to the day when the Government would set a minimum standard for street lighting to meet local requirements. The need for such a provision is emphasized by the development of fast motor traffic. Increased illumination does not necessarily mean greater expenditure; in many cases it is possible to obtain improved lighting conditions and at the same time effect a saving in cost.

It is probable that if more illumination was provided on our roadways, they would be more used during night hours. "How many elderly, frail or nervous people are shut up in their houses throughout the long winter evenings by reason of inadequate suburban lighting? How many of the business streets of our towns lose their usefulness after nightfall? How many brightly lit business houses and places of recreation fail to attract customers because the route to them is poorly lit? Surely all this involves a direct injury to the wealth, happiness and prosperity of the community?"

Reverting to the greatly extended range and increased speed of vehicular traffic, Mr. Davison urged that the Ministry of Transport should devote some attention to the lighting of highways. At the moment, in that county, a main road was being constructed, but so far there had been no mention of adequate provision of lighting. He considered that it was not right to make a roadway safe for traffic during the daytime and leave the road users to their own resources at night-time. Further, a car or motor doing even a small journey may pass through the areas of several urban district councils. The lighting of the road is in the hands of various local authorities, who cannot be expected to light the main through routes. He submitted that some extension of the County Council or Ministry of Transport activities in this direction was desirable, and that the question of the capital cost, or at any rate of providing street lamps, should be undertaken in connection with highway improvement schemes.

The importance of an efficient system of street lighting cannot be overrated. It not only makes the roads usable but has a moral effect on the population and affords protection to both persons and property, thus lessening the amount of police supervision required. It had been stated on many occasions that a public lamp is equal to a policeman, and he thought it would readily be agreed that it was less costly. In Newcastle the amount allowed for street lighting purposes was equal to a lighting rate of 4·9d. in the £. This worked out at 0·73d. per head of population per week. It would probably be difficult to find an individual who was not prepared to pay double this amount per week in order that he could have adequate and efficient street lighting.

In conclusion, Mr. Davison added that, whilst insisting on the necessity for good street lighting, he suggested that a considerable amount of money was often expended on street lighting which could be made to bring a higher return. As an instance he pointed to the economies that could often be derived by the use of methods of automatic control for the lighting and extinguishing of lamps.

* *The Illuminating Engineer*, September, 1926, p. 263.

The Improved Lighting of Sheffield.

A paper on this subject was read by Mr. J. F. Colquhoun (Public Lighting Engineer, Sheffield). In the early part of the paper Mr. Colquhoun gave an account of the conditions on his appointment as public lighting engineer of Sheffield in May, 1924. The price of gas in Sheffield—before the war it was as low as 10d. per 1,000 cubic feet for street-lighting purposes—is amongst the lowest in the country. Hence a relatively generous use of gas in Sheffield has been made. At that time clusters of two or three upright "Kern" burners were in use in many thoroughfares, but, as a rule, only one burner out of three was lighted during the war. Burners and lanterns were in a state of disrepair. There were in use 11,112 gas lamps, almost all consuming 4 cubic feet of gas per hour, and 287 electric lamps with wattages up to 500. During the war 150 lamps had been knocked down and not replaced, and 1,255 lamp standards were in existence but were minus lanterns, burners, etc. There were many roads on which houses were built still unlighted, and a large housing scheme was in an advanced stage of development, but no provision for public lighting had been made.

At the moment it appeared that any large lighting scheme would involve too much money, in view of the then depressed state of Sheffield's industries. It was, therefore, recommended that two-light pre-heater inverted burners should be substituted for the existing obsolete burners, the consumption of gas being thus reduced from 4 to 3·5 cubic feet per hour per burner. It was estimated that by the end of the financial year the saving in gas would pay for the cost of the new burners. By mid-September all upright burners had been thus replaced.

There were no means in the Department of testing the consumption or lighting value of the burners, but the author received permission to purchase a test gasholder, meter, minute clock, pressure gauges, etc., and a lumeter. This apparatus forms the nucleus of what it is hoped will one day be a well-equipped laboratory, the absence of which is regarded as a great inconvenience.

The changes above mentioned made a great improvement in the lighting of the city, and accordingly it was next agreed that all the unlighted lamps should be relit, that unlighted roads should also be dealt with, and that an effort should be made to keep pace with the progress of the new housing scheme. Meantime the cost of electric street lighting was reviewed. The author considered that the charges were unduly high, but his request for better terms was met in a sympathetic manner, and he was soon able to report a 25 per cent. reduction in the cost of street lighting. Considerable economies were also made in the administration of the department, and it was found possible to do more than had been hoped with the funds available. By May 1st, 1926, in addition to the gas lamps relighted, 714 new gas lamps had been erected, and the number of electric street lamps had been increased from 287 to 1,015—a total increase of 2,697 lamps used in the lighting of the city in two years. Improvements in the lighting of tram routes were also made. On May 1st, 1926, Sheffield was lighted by 1,015 electric lamps and 13,081 gas lamps. The large hexagonal lanterns were found quite unsuitable for incandescent gas lighting, and many were in a state of great disrepair. During the two years under review these were replaced by 2,486 new lanterns with porcelain reflectors. Replacement of other lanterns is still in progress.

Another difficulty was the fact that Sheffield does not possess district offices, and it can be imagined how difficult it is to attend to the efficient maintenance of lamps

from one centre in a city of 31,625 acres. Nevertheless, the system has been much improved, and now works much better than at one time seemed possible. One step that has been very useful in stimulating the interest of men in their work has been the founding of the Sheffield Illumination Society, to which the Sheffield City Council makes an annual grant of £15. Lectures are given at monthly meetings, and visits are made to works in the neighbourhood. Arrangements have been made for the borrowing of books on illuminating engineering from the public libraries of the city. So far the Society has been very successful, and its influence has largely contributed to the enthusiasm in their work which the majority of the staff now display.

In the final section of his paper Mr. Colquhoun reproduced a number of photographs showing the lighting of various streets. In the case of Savile Street and Attercliffe Road various forms of two-way directive units are used. The views of motor drivers on the avoidance of glare were solicited, and the author has come to the conclusion that when lamps are, say, 24 feet high little objection is to be taken from this standpoint. Reference is also made to the concerted lighting scheme, the cost of which is shared by the shopkeepers and the Lighting Department, in Change Alley. At present 1,000-watt gasfilled electric lamps 25 feet high on bracket arms attached to tramway poles are being introduced for the lighting of principal thoroughfares.

The estimates of the Department have been fixed at £65,000 for the present financial year representing a 6¾d. rate on the present valuation of the city, or about ½d. per week per head of population. Comparisons between different cities are often made on the basis of the lighting rate, but this is misleading, as the system of valuation is by no means identical in different cities. The extent of this variation is shown in Table I.

TABLE I.

City.	Population	Rateable Value.	Acreage.	Product of 1d. Rate.
		£		£
City of London ...	13,000	8,025,066	675	32,250
Glasgow	1,095,969	11,040,000	19,133	43,750
Liverpool	802,940	6,692,983	24,102	24,500
Sheffield	525,000	2,488,033	31,625	9,686
Leeds	471,600	2,972,203	28,090	11,808
Bradford	290,200	2,522,081	22,879	8,834

TABLE II.

City.	Annual Expenditure.		Lighting Rate.	Cost per head of population per annum.
	£	£	d.	
City of London ...		20,692	0·64	31/10
Glasgow—				
Street	154,565			
Stair	124,581			
		279,146	6·10	5/1½
Liverpool ...		111,494	4·00	2/9
Sheffield		56,216	5·75	2/1½
Leeds		100,925	8·518	4/3
Bradford (1924-25).		75,234	8·25	5/2

But, as Table II shows, cost per head of population does not form a reliable comparison either. For instance, it is absurd to compare the City of London with a provincial city. In any case, therefore, one must bear in mind local conditions. The enormous increase in the number of motor vehicles since the war, and the speed at which they travel, has rendered obsolete the standards of pre-war days. That good street lighting is appreciated by the drivers of motor and other vehicles is beyond question. In a letter expressing "very sincere appreciation" of the improved lighting of the tram and bus routes of Sheffield, the local representative of the Transport Workers said: "It is scarcely possible to over-estimate the value of a well-lighted route to our drivers, the lessening of strain, and the minimizing of danger from accident, and we hope you will continue the good work as well as limited finance will allow."

In the Scottish boroughs the provision of suitable lighting is a legal obligation. The Borough Police (Scotland) Act and the Glasgow Police Act state "that the local authority *shall* make provision for lighting in a suitable manner the portions of the turnpike roads within the city, and the public and private streets and courts."

There appears to be no such legal obligation in any English borough, and the author suggests that English boroughs might, with advantage, adopt the Scottish Act and assume legally the responsibility for sufficient street lighting.

Notes on the Street Electric Lighting of Liverpool.

In Mr. HAROLD DICKINSON'S paper on the street electric lighting of Liverpool, it was recalled that a trial was first made of electric lighting early in the 'eighties, but it was not until 1896 that a real beginning was made with "Brockie-Pell" lamps. The installation of 30 years ago remains to-day, except that 750-watt gasfilled lamps are used instead of the original arc lamps. From 1922 onwards the mileage of streets electrically lighted has increased considerably (from 10⅜ to 83⅞). Various methods have been adopted for tram routes, new suburban arterial roads and housing estates. On tram routes in 1923 300-watt gasfilled electric lamps were introduced, the lamps being staggered, so that the distance between poles diagonally is not more than 25 yards. The original pattern of fitting was ultimately considered unsatisfactory owing to the "patchy" effect, spots of light being formed immediately under the lamps. This was due to the shape of reflector and the position of the lamp therein; the drawback was overcome in the new standard fitting, in which the rays from adjacent units overlap. In certain streets 500-watt lamps have been introduced, and in others which are considered the most important in the city 750-watt lamps are employed.

Attention is drawn to the new suburban arterial roads, of which many good types have been recently constructed in Liverpool, most being 120 feet wide and one 220 feet wide. On these the lamps (usually 100-watt) are mounted 20 feet high. At the time of construction there were no buildings about, and the illumination was considered sufficient; but with the development of these roads and growth of traffic, higher illumination may shortly become necessary. On new roads in housing estates 60-watt lamps at a height of 11·2 feet, and at an average distance of 50 yards, are being adopted. Experiments with somewhat higher columns are, however, being made.

The problem of reduction of lighting at midnight is also discussed. In Liverpool it has always been customary to diminish the lighting at midnight, as after that hour the traffic is much less. The higher units, from 300 to 1,000 watts, are extinguished, and 60-watt lamps lighted up instead. In the new arrangements alternate lamps are extinguished, where possible. On the new housing estates there is at present no reduction in lighting, as the lamps are lighted by hand, and the cost of labour is an item to be considered; but an experiment with time switches is being made.

The average cost per lamp for all classes of lighting works out to about £7. Electricity for street lighting is supplied at 2d. per unit for the first 70,000 units per quarter and 1d. per unit thereafter. The average price last year was 1·56d. per unit. In the remaining part of the paper the system of overhead wiring, underground services and maintenance are described.

Lighting Hours.

The question of "Lighting Hours" was briefly discussed in a paper by Mr. R. BEVEREDGE, who explained that each authority had its own individual schedule for the lighting and extinguishing of public lamps. There is not, as might be supposed, any definite time schedule for public lamps prescribed by Act of Parliament. Even in London, where there are many different local authorities, there are different time schedules. As an instance, Mr. Beveredge discusses operations in a small town, with a schedule of lighting from an hour after sunset to an hour before sunrise. If lamps are all operated by hand a full hour may be taken in lighting

up and extinguishing, so that, in order to keep within the schedule, some lamps may be seen burning in full daylight. Whatever arrangements are made, some time is usually necessary for the lighting up and extinguishing of all lamps, so that some waste of light always occurs in practice, though when automatic controllers are in use the margin may be reduced to smaller dimensions.

In conclusion, the need for some standard practice is pointed out, and it is suggested that a table might be adopted representing the minimum lighting hours for Greenwich, assuming simultaneous operation, from which geographical corrections could be easily effected.

Motor Traffic in Relation to Lighting.

Mr. Edward Fryer, in opening his paper on the above subject, remarked that at last year's conference there was agreement on a number of points; for instance, that good lighting aids in preventing crime, that recognized standards for different classes of highway—town and country—are desirable, that outside the large cities the lighting authority is too small a unit, and that more co-operation between adjacent authorities is needed in the interests of uniformity. Further attention was drawn to the need for serious consideration of the financial side, with, if possible, State aid.

Existing legislation is partly compulsory and partly permissive. The Towns Improvement Clauses Act of 1847 compels a person depositing material or making holes in a street to fence and light from sunset to sunrise. But there is no compulsion on the lighting authority to provide efficient street lighting. It is permissive. On the other hand, we cannot ask for compulsory legislation until public opinion has been educated to require a minimum standard.

Mr. Fryer suggested that advantage might be taken of Section 6 of the Roads Improvement Act to enable the Ministry of Transport, at the cost of the Road Fund, to conduct experiments on proper lighting in the interest of motorists. He suggested that experiments might be undertaken along the great North Road through the county of Northumberland.

Either the local authority or the motorist should have to provide sufficient illumination to render travel safe. To-day the motorist provides sufficient for his needs, the highway authority has to light obstructions, and the lighting authority provides what it considers sufficient, and in many cases not even that. He believed that during the winter there would be successful experiments which would enable motorists to distinguish, more clearly than ever before, obstructions on the road, also curves, dips and bottle-necks, the obscurity of which has led indirectly to more accidents than many people realize. But such experiments can never take the place of good illumination provided on the highway, because they must always be dependent on the light carried by the traveller.

The lighting on the vehicle, as adopted for all A.A. staff cars, consists of (1) side and tail lights, (2) dipping head lamps and a fog light, fixed to the near side dumb iron, and (3) lamps for instrument board, inspection, and passenger use.

With this equipment it is possible to drive in safety, except during very bad climatic conditions. But in most populous places it is still necessary to drive with the fog light on in order to avoid the elusive and unlighted cyclist.

The worst form of dazzle is reflected sunshine, either from a bright bonnet and a badly set windscreen or off a wet road. Undipped glaring headlights on approaching cars may be met sometimes, but what is almost worse are the reflections from windscreen, mirror and other bright parts created by following cars with powerful headlamps. The "V" and tilted windscreens prevent this, but in some covered cars it is essential to have a blind in the rear. In conclusion, Mr. Fryer expressed the opinion that developments in connection with the lighting of private cars are to-day far in advance of the other and more important side—the proper and efficient lighting of the highway.

Discussion

On the motion of Mr. A. C. Cramb, a cordial vote of thanks was moved to Mr. Davison for his Presidential Address. The discussion on Mr. Colquhoun's paper was opened by Mr. Langlands (Glasgow), who complimented him on the thorough record of some uphill work done in Sheffield. He referred to the wide differences in the price of gas and electricity throughout the country, and the fact that public lighting was held in much greater esteem in some cities than in others. Progress, however, was necessarily gradual. One could lead a corporation, but not drive it, and one of the most potent influences was the force of example. If one area was better lighted, others would follow. Mr. F. P. Tarratt (Newcastle) also complimented Mr. Colquhoun on his paper, and alluded to the benefits of automatic control, which had been successfully adopted in Darlington. Mr. Musgrove (Sheffield Gas Co.) confirmed the improvements made by Mr. Colquhoun in securing more efficient burners. Mr. L. Gaster (Illuminating Engineering Society) urged the importance of establishing what really represented good lighting in the streets and the basis on which improvements were judged—a consideration of importance to those who dealt with the allocation of money. Mr. Jepson (Sheffield) emphasized the valuable influence that could be brought to bear by Rotary Clubs, if they could be interested in public lighting. Mr. C. S. Shapley, Mr. Branston, and others also joined in the discussion.

In the discussion of Mr. Fryer's paper, Mr. L. Gaster recalled that the Illuminating Engineering Society had always advocated better lighting of important highways, and he had urged that the lighting of such thoroughfares should come within the province of the Ministry of Transport. But it was essential that any deputation approaching the Ministry on this matter should be thoroughly representative and armed with definite plans for procedure. Mr. C. S. Shapley and others discussed the functions of the Automobile Association in relation to public lighting. Mr. Fryer, in reply, pointed out that the Ministry of Transport had already shown an interest in some aspects of highway lighting, for example by providing, out of the Road Fund, signs which were illuminated at night. Illumination of dangerous cross-roads was an exceedingly important matter. In some cases A.A. scouts could not be put on duty at such crossings owing to the great risk involved.

The suggestions made by Mr. Beveredge in regard to lighting hours were also discussed in some detail, Mr. Winston (London) agreeing that a standard time-table was necessary, but that in view of climatic conditions it might be necessary to have two separate schedules, one for the south and one for the north.

Other Events.

The various other events announced in our last issue duly took place. The members received a civic welcome from the Lord Mayor, who also responded to the toast of "Our Civic Authorities," given by Mr. Shapley at the luncheon. On this occasion the toast of "The Institution of Public Lighting Engineers" was proposed by Alderman A. Wilkie, and responded to by the President (Mr. R. Davison). The proceedings also included visits to Whitley Bay and to the works of the Newcastle gas and electrical supply companies. A tour was arranged with the object of inspecting methods of street lighting in Newcastle, and another event was the progress through the streets of a tramcar illuminated with 600 coloured lights, designed to stimulate interest in the Town Moor Recreation Ground. An account of the representative series of exhibits of street-lighting appliances will be found on p. 302.

It is understood that the Conference next year will take place in Brighton.

POPULAR & TRADE SECTION

COMPRISING

Installation Topics—Hygiene and Safety—Data for Contractors—Hints to Consumers

(The matter in this section does not form part of the official Transactions of the Illuminating Engineering Society; and is based on outside contributions.)

Wiring the Homes of Britain

The E.D.A.—E.L.M.A. Better Home Lighting Campaign

ON October 1st the E.D.A.—E.L.M.A. Better Home Lighting Campaign will be initiated, and an illustrated booklet issued by the Electrical Development Association indicates very clearly and effectively the scale on which the movement is to be carried out.

One of the main features is the National Ballot Competition, which we understand is open to everyone except employees of the Associations named. The problem consists of two parts; firstly, the selection of appropriate fittings (of which a variety is illustrated in the booklet) to fill assigned places in the various rooms of a typical home; and, secondly, the arrangement in order of twelve main advantages of electric lighting—the aim being to adopt the order which it is thought will be selected by the majority of competitors. The nature of the competition is clearly explained in the illustrated booklet "Electric Lighting in the Home," which also contains concise introductory matter dealing with the problems involved in lighting the chief rooms. The competition will thus have an educational value, as these hints will be read by competitors, and the prizes are such as to ensure a wide response. The first prize is to consist of a freehold electric house or £2,000 in cash; the second and third prizes consist of domestic electric appliances or complete electric wiring to the value of £200 and £100 respectively, and there are 25 other prizes to be won.

This, however, is only one amongst many forms of propaganda to be adopted. There will be widespread advertising in the daily press. Committees are being organized in seven main districts, and under their supervision local demonstrations in a model electric home will be arranged with the co-operation of supply undertakings, wiring contractors, builders, house furnishers, etc. The booklet "The Open House Electric," intended as a guide to the formation of such committees, and the suggested method of carrying on work, is exceptionally complete; there are hints on local display advertising, and press articles, posters and electric signs, methods of issuing invitations, etc., and the procedure to be followed in the equipment and demonstration of the electric homes is outlined in detail, with the aid of many illustrations.

Six standard leaflets and suitable circular letters of invitation have also been prepared, the former being of a very attractive get-up. The one entitled "A Joy for the Home," and illustrating the advantages of electric lighting, is perhaps the most effective. Consumers are advised to cease regarding proper lighting as a luxury. It is pointed out, for instance, that the average household expenditure on electricity forms only one-fiftieth of the food bill, one-twenty-fifth of the rates and taxes, and one-twelfth of the clothing account—that a consumer can light his room for an hour for less than the cost of his evening paper, less than the price of a box of matches, and less than the wear of his boots and shoes for the evening.

The object of the campaign is justified by the quoted fact that of ten million homes in Great Britain seven million are within the areas supplied with electricity. Yet only 1,400,000 are wired for electricity at present. One is glad, however, to see that throughout the literature the need for better lighting of the home is strongly emphasized, and the co-operation of the E.L.M.A. Lighting Service Bureau should be helpful in showing how this better lighting is to be obtained. Domestic lighting is dealt with in a special E.L.M.A. Handbook (No. 4, "Electric Light in the Home"). This is fully illustrated, and each room is dealt with in turn. Towards the end of the book two pages are devoted to a series of telling illustrations showing the right and wrong methods of lighting in various circumstances, and some coloured slips showing the amount of light reflected from wallpapers of different colours are included. The E.L.M.A. Lighting Service Bureaux in London, Glasgow, Newcastle, and Manchester will also play an important part in the campaign, being each situated in the heart of densely populated areas and well equipped for the organization of practical demonstrations of home lighting. The Electric Lamp Manufacturers' Association has also arranged for the familiar revolving-light model electric home to go on tour, and local undertakings can be arranged to have the use of this ingenious device.

The whole scheme provides for the co-operation of all sections of the lighting industry, and all particulars and assistance can be obtained on application to the British Electrical Development Association at 15, Savoy Street, Strand, London, W.C.

The New Decorator

Making the Most of Electric Light

EVERY woman knows that her home is the "Outward and Visible Sign" of her own personality. In creating it she has used a medium for self-expression in much the same way as the artist his canvas or the musician his instrument. The modern housewife, however, finds the problem of obtaining the necessary materials for artistic interpretation (her "canvas" and "manuscript") one which requires the application of the practical side of her nature for its solution, and although, when making additions to the comfort and beauty of the home, her eyes may be lifted wistfully towards the vision of the home ideal, inevitably she has to return to a prosaic contemplation of the family budget. It is when financial outlay is of necessity modest that she realizes the value of electric light as an interior decorator.

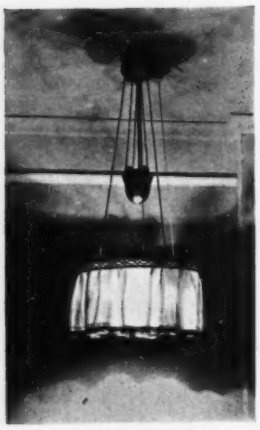


FIG. 1.—Dining-room Pendant, with clear-glass lamps in use, showing patchy lighting effects and heavy shadows.

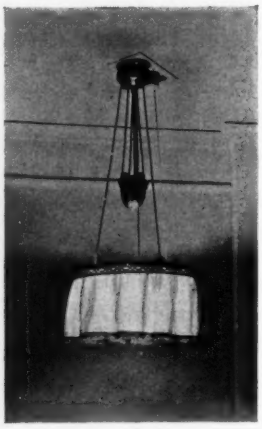


FIG. 1A.—Dining-room Pendant, with white lamps in use, improved quality of light with absence of heavy shadows.

To many housewives electric light represents a form of illumination which, from the point of view of cleanliness and convenience, is a vast improvement on previous methods. Beyond that—well—its advantages are not outstandingly obvious; in fact, it might even be criticized on account of its harsh brilliancy and cause a sigh of regret for the days of soft, mellow light which, though inefficient, was at least a more kind and sympathetic light. The fact that electric light, of all forms of illumination, is the most adaptable has not been brought to the notice of the average housewife, and she does not realize that the longed-for "kind" light can be obtained just as well with electricity as with the mediæval candle.

Not only light which deals equally well with complexions and the favourite colour scheme, but one which will give bright light just when and where it is wanted without any disconcerting glare. Glare is only too prevalent, and has given rise to the prejudice that electric light is bad for the eyes because it gives "too much light." The modern lamp is certainly bright, but it is only harmful to the eyesight when it is used in a thoughtless way.

All previous illuminants, from oil lamps, candles, up to and including the carbon electric lamp, were left exposed to the eye in order to get all the "raw light" possible from them, and this ancient way of using light still persists in many homes to-day with no regard to the change which has taken place in the light source itself. Hence we find the curious situation of the modern home-owner employing the crude lighting methods of the Middle Ages in a home which is twentieth-century in every other respect. For example, the brilliant electric lamp is often hung up with a clear-glass shade, which still leaves it exposed to to the eyes. Naturally there is a feeling of discomfort whenever the lamp bulb comes within the line of vision, and at the same time the raw light will spoil the artistic effect of any room, and inevitably cheapen its appearance.

FIG. 2.—Drawing-room Electrolier, equipped with clear-glass lamps, glare and shadows on ceiling.

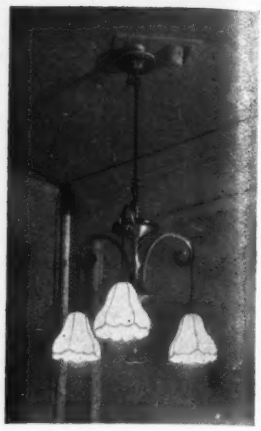


FIG. 2A.—Drawing-room Electrolier, using white lamps; no glare and absence of shadows.

Every lamp used in the home should be adequately shaded or completely concealed from view, and used in modern lighting fittings designed to utilize the raw light from the lamp bulb to the greatest advantage, so that there is plenty of "eye-restful" illumination throughout the room with a complete absence of patchy brightness and harsh shadows which are quite capable of spoiling the effect of any furnishing scheme.

When economy is a serious consideration a change of lamps will improve the illumination and bring charm to a room more quickly than anything else. But it is necessary to make the consumer realize that changing lamp bulbs does not mean buying large lamps which use more current, but lamps which use the same amount of electricity while giving a better quality light. White lamps are little known to the general public, yet opportunities for their use in every room in the house are infinite. The dining-room pendant takes on a new lease of life when clear-glass lamps are replaced by white ones; better diffusion and the avoidance of glare, which can

FIG. 3.—Floor Standard, designed to give both general and local light.

be so annoying to those seated at the dining-table, being only two of the points in their favour. Besides the improvement from the lighting point of view, there is the consideration of the improved appearance of the fitting itself. When clear-glass lamps are used the silk flounce appears to be of very poor quality, since the bright spot of concentrated light from the filament can be seen through the silk; white lamps, however, cannot be seen through it, and the whole flounce, radiating light, appears to be made of better quality material. A further advantage lies in the fact that no shadows from flex or chain are seen on the ceiling.

FIG. 4.—Table Standard in use

The same change can be made to advantage in the drawing-room electrolier. This type of fitting, with its varying amount of arms spread out to make the best (or worst) of some clear-glass lamps of uncomfortable brilliancy, and frequently embellished with glass shades which do not lessen the glare from the lamps, is an extremely poor lighting combination when considered from the standards of modern illumination schemes. Acute discomfort from glare and the direct contrast of intense brightness with heavy shadows will diminish in no small measure the charm of any delicate tones and colour effects in the room. After substituting white lamps, still further improvement may be made by scrapping the clear-glass shades and putting in their place some of decorative glass or delicately tinted silk, chosen with an eye to the room's colour scheme.

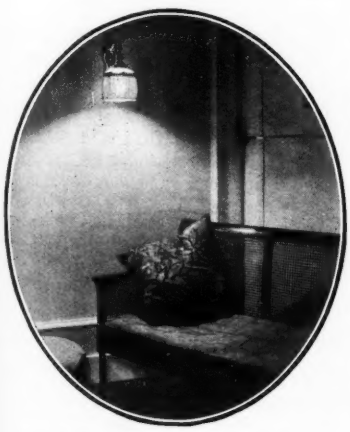


FIG. 5.—Pendant type of Wall Bracket.

Good use may be found for the white lamp in fittings which provide indirect or semi-indirect lighting. Very often the effect of a beautifully tinted alabaster bowl is spoilt by the fact that the shadows of its rim and of its chain and flex are thrown on to the ceiling. Due to its diffusing surface, a white lamp will prevent heavy shadows, leaving the ceiling free to act as a perfect diffusing and reflecting medium. Although extremely restful to the eyes, indirect lighting is often criticized on the score that it is so well diffused as to become monotonous or "flat," and in this case an improvement can be made by introducing colourful notes of change with portable lamps, floor standards, and wall brackets.

It is in a scheme of this sort that the furnishing and decorating value of light is displayed so convincingly. There are bound to be those who say that portable lamps and silk shades are expensive, but, compared with the cost of the various knick-knacks that in the past have gone to the making of the average drawing-room, lamp expenditure becomes negligible. The modern drawing-room has profited by the demand for space and comfort rather than overcrowded discomfort; restfulness, both for body and mind, is the keynote of the well-furnished drawing-room, and the room with a few pieces of furniture to conform to this ideal, and as plain a background as possible, only requires the subtle touch and colour effect of the right lighting equipment to make it all that a room should be. A portable lamp near the armchair or settee, a floor standard at the side of the piano, wall brackets placed where they may give lighting service as well as decorative effect; such a room is indeed furnished with lighting comfort and beauty. As an element of change and variety coloured lamps are recommended as being the cheapest and most convenient way of quickly changing the "atmosphere" of a room. Flame, yellow or orange-tinted lamps placed in a portable lamp or wall brackets can instantly flood the room with the warm glow of tropical sunshine.

It has been found that certain colours are successful in giving an impression of cheerfulness, warmth, and general well-being, while others may have the opposite effect of creating an atmosphere of coolness, and, if carried to excess, of depression. The stage makes use of these principles in its employment of coloured light, and there is no reason why they should not be applied in the home.

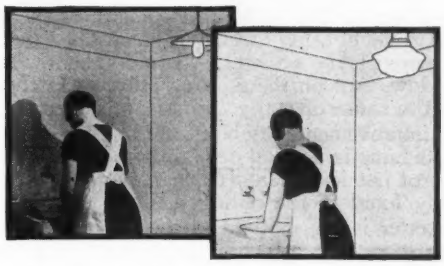


FIG. 6.—Comparison of Bad and Good Lighting in Kitchen.

Among the "cheerful" and "warm" colours may be included yellow, orange and red, and among the "cool" ones blue and green. For instance, a room which is flooded with softly diffused yellow or amber light, with discreet touches of orange or red in wall brackets or ornaments, will succeed in giving an impression of cosy warmth to anyone entering. As a welcome after a journey in wintry weather it would be ideal. Experiments with coloured light in the home will show at once that the colour of objects can be apparently changed when seen under coloured light. For instance, if orange light is used in a room which has light-blue curtains the curtains will appear a slate grey, while green light will make a red carpet appear brown. These difficulties are soon overcome, however, and successful and pleasing colour combinations can be evolved with ease. Conversely, the sense of coolness on a hot summer evening can be achieved by the use of green and blue light, but care must be taken that the desired effect is gained by using blue or green in wall brackets, ornaments, or small portable standards, the room being generally lighted with white light; to light the room generally with blue or green light would be fatal, the effect being altogether too depressing. When using the warmer tones white light may be dispensed with, as it is possible to read quite comfortably by yellow light.

This subject of the use of coloured lamps in the home is one on which no definite cut-and-dried advice can be given. Every room has its own character, and needs individual treatment; besides which there is the strong element of personal taste which compels every home-owner to follow his own inclinations based on his own experiments. Chosen with care, however, coloured lamps are invaluable as a means of imparting individuality to a room at very small trouble and cost.

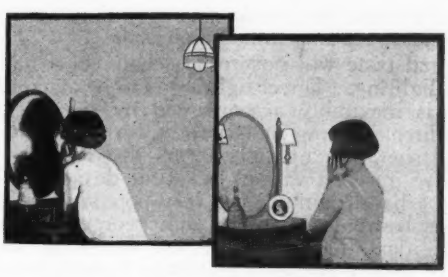


FIG. 7.—Bad and Good Table Lighting, showing brackets attached to mirror.

However fascinating may be the task of decorating with light and creating new and beautiful effects, there are times when the practical aspect of illumination becomes more important than the decorative. Flights of imagination inspired by the possibilities of coloured lamps in the drawing-room have to be curbed to a serious consideration of the value of foot-candles in the kitchen.

The organization necessary for the smooth running of the modern home may be said to originate in the kitchen, and anything which hinders that organization—and poor lighting is definitely a hindrance—should be summarily abolished. In many kitchens one finds the housewife tolerating the discomforts of the harsh, glaring light given by a clear lamp suspended on a cord pendant with only a conical opal shade as a protection against the naked brilliance of the lamp.

A moment's thought will bring the realization that most of the work in the kitchen is done facing the wall at the cooker or the sink, and sometimes the kitchen table. Crude lighting, which is invariably suspended too low, compels the worker to " stand in her own light," and shadows cast on the cooking stove or kitchen table may be the cause of many culinary mistakes.

Much improvement may be effected by the substitution of a white lamp in a small deep opal shade suspended at a height of not less than 7 ft. 6 in. from the floor, and preferably fixed to the ceiling itself.

Still better is the modern kitchen unit, consisting of diffusing glassware, which, entirely enclosing the lamp and making it dustproof, can be fixed close to the ceiling. Not only is the light comfortable and free from glare and harshness, but the diffusion afforded avoids the possibility of hard, dark shadows being cast. Any shadows that exist will be light and not sufficiently dense to be a hindrance. The quantity of light, apart from its quality, that is, freedom from glare and good diffusion, is an important point; a lamp wattage equivalent to approximately three-quarters of the floor area in square feet should be used. For example, in a kitchen 10 feet by 13 feet, equal to 130 square feet of floor area, the nearest standard size of lamp would be 100 watts.

A happy medium between the decorative effects of the drawing-room and the practical needs of the kitchen may be found in the bedroom, where lighting requirements resolve themselves into adequate illumination for dressing, local light for the bed, and general lighting for the whole room. With a central light, which is not well diffused, it is inevitable that shadows are cast on to the face of anyone seated at the dressing-table, and although a one or two-light pendant fitting placed above the dressing-table will give adequate illumination, it has the drawback of fixing the position of the dressing-table itself. However charming a room may be, there are times when its appearance becomes monotonous, and a welcome change can be made by moving the various pieces of furniture to different positions; but where a lighting fitting has been fixed to suit the arrangement of the furniture it is apparent that changes will be most unsatisfactory. The most practical way of solving the problem is by the use of wired furniture. The dressing-table can be equipped with a bracket on each side of the mirror, fitted with small lamps and silk shades of suitable design and colour. These brackets are connected to a wall plug by means of flexible wire. Provided there are wall plugs in the room, this arrangement makes it possible for the housewife to move her furniture at will, and at the same time be sure of adequate light at all times. A standard lamp on the bedside table or an easily controlled bed bracket, both equipped with white lamps, makes reading in bed a pleasure.

Personal taste will govern the choice of a fitting for general lighting. Direct lighting is to be avoided, since its use is inevitably accompanied by shadows, while semi-indirect lighting enables the room to be illuminated so that shadows and glare are avoided. Bowls of decorative glass in various beautiful designs, many of which are hand painted, are very popular, and for the luxurious bedroom a bowl of silk georgette lined with white is ideal. For practical use and long service a fitting of totally enclosed glassware is recommended.

This somewhat general survey of the most important rooms in the home is yet sufficient to indicate the improvement that can be effected if a little thought and care is given to the subject. Good lighting is the least expensive of home comforts, and often costs no more than bad lighting. The difference between the two is only a matter of using the same amount of current in the right way and not wasting it in the bad way. Those who can realize the value of the electric light and apply the few simple rules for its use which have just been described will find it the most valuable labour-saving, cheap, and beauty-creating commodity obtainable, and one which may deservedly take its place among the beneficial wonders of modern life.

E.L.M.A. Lighting Service Bureau

Winter Course of Lectures

A FEATURE of the winter programme of the E.L.M.A. Lighting Service Bureau will be the organization of a series of lectures on Electrical Illumination intended for the benefit of those who can only attend in the evenings. Whilst the Illumination Design Course has proved very useful, it is recognized that not everyone in the electrical industry is able to spare four consecutive days to the work.

The lectures will be held fortnightly on Monday evenings, and each subject will be dealt with by an expert. Both practical and theoretical considerations will be discussed, and many new and recently introduced experimental demonstrations will be incorporated in the programme. In some cases those present will be given hints on the design of lighting schemes, which they will prepare under the guidance of the lecturer, and after each lecture free discussion will be invited.

Those desiring to attend are asked to apply to the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, W.C.2, London, for a ticket of admission, which will entitled the holder to attend the full course.

As the accommodation is limited to 100 persons, applications should be made at the earliest opportunity.

The following is the list of lectures arranged:—

Lecture.	*Monday Evenings, at 7-30 p.m.*
" Lighting Fundamentals and Principles of Light Control "	October 11th, at 7 p.m., for registration; Lecture at 7-30.
" Simplified Methods of Designing Illumination Schemes "	October 25th, at 7-30 p.m.
" The Art of Home Lighting "	November 8th, ,,
" Electric Lamp Manufacture and Economics of Light Production " ...	November 22nd, ,,
" Light as a Decorative Medium "	December 6th, ,,
" The Lighting of Shops and Stores " ...	January 24th, ,,
" The Principles of Floodlighting " ...	February 7th, ,,
" Possibilities of Colour Lighting " ...	February 21st, ,,
" Selling Better Lighting "	March 7th, ,,

Prospects of Electric Lighting

The central station company has no cause to worry about a saturation point in lighting. Illumination intensities are very generally far below those desirable or economically possible. The greatest convenience is far from having been achieved. The use of light for æsthetic and specific psychological effects has barely begun. Then, finally, luxurious lighting is still to be developed.

So it is in all fields. Artificial lighting is in its infancy. To be better than daylight is its goal, and the realization of that ambitious object will require enormous growth for generations.—*The Electrical World.*

Announcing

MAZDA research and scientific enterprise have brought forth a new type of Mazda Electric Lamp—frosted on the ***inside*** of the bulb. For twenty years experimenters have tried unsuccessfully to achieve this result; but always, until the invention of the PEARL MAZDA LAMP, every attempt to frost the inside of the bulb has made the glass brittle and weak. Now, however, all difficulties have been overcome, and in the PEARL MAZDA LAMP there is available for all light users a lamp with a pearl-tinted globe which obscures the filament, minimizes glare, softens shadows, and emits practically as much light as a clear lamp. PEARL MAZDA LAMPS cost no more than clear lamps of the same ratings.

Architects, decorators, designers and illuminating engineers are at one in their opinion that PEARL MAZDA LAMPS strike an entirely new note in artificial illumination, and that in appearance and performance they are unexcelled.

The **PEARL** **MAZDA** *Internally Frosted Lamp*

Folder L385 giving further particulars is available for overprinting. Please write for same.

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The British Thomson-Houston Co., Ltd.
Crown House, Aldwych, London, W.C.2

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Domestic Lighting with Holophane Glassware

THE two accompanying illustrations, furnished by Holophane Ltd., illustrate typical problems in domestic lighting. In Fig. 1 we have the usual arrangemeent of twin lighting units at the dressing table, capable of being raised and lowered. These reflectors were specially chosen for their soft and yet efficient effect. The choice of the reflector for such units is of considerable importance, as on this both the distribution of light and conditions of shadow largely depend. Besides directing the light downwards, a well-designed reflector plays an important part in softening the light; it is naturally essential that the filaments should be properly screened and not allowed to trouble the eyes of the person at the table. It should be strongly emphasized that in all cases a double pendant is desirable. It is common knowledge that the face cannot be completely lighted by a single unit on one side only—a fact of which one becomes painfully conscious when shaving.

In Fig. 2 we have the lighting of a dining-room by a central Holophane Reflector Bowl. The lighting of a dining-room offers scope for discussion. There is something to be said for the conventional method of concealing the lamps in an adjustable silk shade, but this is apt to leave the surroundings in semi-darkness unless supplementary general lighting is provided. Hence there are advantages in the method here illustrated, especially when, as frequently happens in houses of moderate size, the room is not utilized as a dining-room only, but also for reading and writing.

Authors, in discussing domestic lighting, are somewhat apt to assume that a certain room is invariably used for a definite purpose. As a matter of fact, living rooms in many cases may be used for all sorts of occupations. Hence the need for flexibility in the lighting arrangements, and the provision of supplementary outlets for portable lamp standards, etc.

FIG. 1.—Bedroom Lighting with two Holophane Reflectors over dressing table.

FIG. 2.—Showing lighting of a dining-room with Holophane Reflector Bowl.

The Use of "Vitaglass" for Windows of Schoolrooms

Much has recently been heard of the health-giving properties of the ultra-violet rays in sunlight, which are largely obstructed by ordinary window glass. The suggestion that windows of schoolrooms should be made of some material permeable to these rays, such as the new "Vitaglass" invented by Mr. F. E. Lamplough, has been made in some quarters. This glass allows ultra-violet rays down to 2750 A to be transmitted. In this connection a correspondent draws our attention to an interesting experiment described in Dr. Ferguson's new book on "The Quartz Mercury-Vapour Lamp," (published by Messrs. R. H. Lewis & Co.).

In June, 1925, the writer persuaded the Smethwick Education Committee to install this glass in a classroom in one of the local schools. Boys of nine to eleven years were taken, and arrangements were made to keep thirty boys in this classroom for twelve months. A control group of boys occupied an adjoining classroom with a similar aspect. The heights and weights of these two groups were taken, together with hæmoglobin estimations, and these observations were repeated at the end of nine months. (See Table I.)

The class master worked out the loss of attendance in each class for the three months preceding the test, and for the nine months of the test, and gives the following results, as shown in Table II.

The results are certainly striking. One knows the need for confirmatory evidence in all such cases, but it is clear that the question is one that deserves study at the hands of school medical officers.

TABLE I.

	June 1, 1925.	Mar. 31, 1926.	Average gain.
Control Class—			
Average weight	60·04 lb.	62·87 lb.	2·83 lb.
Average height	51·78 in.	53·30 in.	1·22 in.
Average hæmoglobin (per cent.)	76·58	84·11	7·53
Vitaglass Class—			
Average weight	67·90 lb.	74·01 lb.	6·11 lb.
Average height	54·06 in.	55·92 in.	1·86 in.
Average hæmoglobin (per cent.)	77·90	94·04	16·14

NOTE.—Von Fleischel's hæmoglobinometer was used.

TABLE II.

Period.	April to June 29, 1925.	June 30 to July, 1925.	Aug. 24 to Dec. 22, 1925.	Jan. 11 to March 29, 1926.
Control Class—				
Percentage of absences	8·43	5·93	8·43	6·65
Decrease in percentage of absences, 1·78.				
Vitaglass Class—				
Percentage of absences	12·78	11·17	7·93	7·27
Decrease in percentage of absences, 5·51.				

A view over part of Sheffield from the top of the works of Messrs. Walker & Hall Ltd., the well-known manufacturers of gold, silver and electro plate. The photograph was taken on a March day when the smoke from factory and domestic chimneys had been partially cleared away by wind and a slight fall of snow.

Fighting Smoke—the Enemy of Sunlight

COAL SMOKE, like the poor, is always with us. Indeed smoke makes us poorer as a nation—and not alone in measurable wealth. It robs our lives of sunshine. Not only does this evil, on a most cautious estimate, cost over £40,000,000 a year in waste and damage; it loses us health and happiness—vast and irreparable loss. Need it be "always with us"?

The Battle is Already Begun.

Smoke, we can show, will not be always with us. Already the futility of all this waste has been brought home, and smoke abatement is no longer thought a cause for cranks and faddists. A Ministry of Health Committee reported in 1921 on "the serious danger to health and damage to property" which domestic smoke especially was causing; the Coal Commission underlined the verdict; and Parliament itself is taking action. The evil is recognized and proved, the facts are public property. The indictment of coal smoke is complete, damning and officially accepted.

Smoke makes it "Easier to Die."

Fog is a characteristic of our island, a discomfort that we cannot escape. But natural fogs are not particularly harmful compared with the smoke fogs that we make ourselves. Thirty and forty years ago the "London Particular," the good old "pea-soup" fog in which our fathers almost took a pride, was looked upon as a necessity, as something which in varying degree was natural to every modern town; whereas in truth there is of course no smoke—and no smoke fog—without the raw coal fire.

An ordinary white-mist fog, admittedly, is not exactly beneficial to our health. But the difference between the ravages of clean fogs and of smoke fogs is great and conclusively proved. Death-rate figures in Glasgow, where in cold weather natural white mists are soon turned into smoke fogs, have been compared with the records of seven small Scottish towns where the mists are but little polluted. In the small towns deaths from respiratory diseases rose during cold foggy weather from 31 to 93; but in Glasgow they rose from 35 to 233.

This is no isolated instance. Nor is the danger to be measured solely by the increase in deaths; there is also the misery and cost of all the extra illnesses which are not actually fatal. Nor again is this cause of sickness and mortality active only at times of fog; it operates continuously, though in a lesser degree, on the health of all town dwellers, breathing, year in year out, polluted air and, what is even worse, deprived of sunlight.

No wonder that Dr. Greenwod, statistician to the Ministry of Health, has said: "It is just as hard to earn a living in Reading or Northampton as in Bolton or Warrington, but it is much easier to die—nearly twice as easy if you are a man between 45 and 65—in Bolton as in Reading."

"It is much easier to die"—where the air is polluted by smoke. But it is not so difficult (and a better plan to most men's way of thinking) to stop the pollution, and live.

The Enemy is in our Homes.

The only way to stop the pollution is to stop burning raw coal and substitute a smokeless fuel for it, especially in domestic grates and ranges. More than half the smoke of our cities comes from domestic chimneys, and not only the greater part but also the more objectionable and destructive part; and this, the result of imperfect combustion, is, as the Coal Report observed, "inevitable so long as raw coal is burned for domestic purposes in the prevailing manner.

To this problem there is a solution. But first let us glance at its dark side—the appalling seriousness of the smoke evil as it is known to-day.

We Turn Coal into Filth.

London is by no means the smokiest of our cities, and yet the soot that fell in London in the year 1925-26 would have covered the whole area of Hyde Park—nearly 400 acres—to a depth of ten inches. As lately as 1921 the Smoke Abatement Committee of the Ministry of Health estimated that approximately 2½ million tons of potential fuel in the form of soot escaped annually into this country's atmosphere from domestic fireplaces, and half a million tons from industrial chimneys. At £2 per ton this represents a direct waste of £6,000,000 a year. This soot, the Report of the Coal Commission said, is equal in weight to nearly three days' output of all the collieries of Great Britain—"in effect, the work of a million men for three days every year is devoted to providing the soot which pollutes our atmosphere."

We Pay an Enormous Bill for It.

Apart from the direct loss, think of the damage to property, to buildings, furnishings and clothing—in

Manchester smoke increases the cost of household washing alone by over £200,000 a year. Sir Frank Baines, Director of H.M. Office of Works, stated in 1924 that his Department spent £1,750,000 a year in looking after Government Buildings, the Royal Palaces and the Houses of Parliament, and that from 30 to 40 per cent. of this might be saved if the air were acid-free and smokeless.

Think of the delay to transport—in London in 27 days of fog during three recent years the buses unable to complete the scheduled mileage numbered 10,202 and actually lost over 400,000 working miles. Two million people travelling into London every morning are delayed for an average of an hour each during a heavy fog, with a loss of working time worth perhaps £150,000. True, smoke does not make these fogs, but fouling and blackening them doubles their paralysing effect.

And we Live (or Die) in Darkness.

Think, too, of the loss of sunshine. The haze of smoke that hangs over our cities never ceases to weaken the sunlight. Westminster only gets two-thirds of the sunshine that the open country gets—taking the whole year through. In summer, when coal fires are largely out of use, Westminster enjoys as much as 80 per cent. of country sunshine—yet even that means loss enough. But in the winter months less than 40 per cent. is allowed to filter through the smoke-fouled air.

So is it in all our towns. Not only do we breathe polluted air, we live in sunless gloom; and Local Authorities have to go on spending over £2,500,000 a year on the treatment of tuberculosis, the scourge to which the Italian proverb most exactly applies—"All diseases come in the dark and are cured in the sun."

There is a Ray of Light.

Even these few facts and figures show that the smoke curse to-day costs a colossal sum in damage and an inestimable loss of health and happiness. A ray of light on this black picture is, however, shining. Bad as the evil is, it was much worse. In 1924 Sir Napier Shaw, the famous meteorologist, said: "Thanks to the use of gas fires and other smokeless appliances the London smoke barrage is not so bad as it used to be. According to reliable statistics, solar radiation in Westminster in 1881 was as low as 17½ per cent., but in 1920 it had risen to 45 per cent. Since then a further improvement has coincided with an increase in the use of gas appliances, whose numbers in this district have trebled in the last four years."

In 1884 there were nearly 30 days lost in dense, black fog. Forty years later the annual lost days were under ten.

In 1912 the sootfall in London was 76,000 tons. By 1925 this figure had been more than halved—to 31,500. The same thing has happened in most other towns. In Glasgow in 1915-16 the sootfall was 450 tons per square mile; ten years later it was down to 260.

How we are Restoring our Lost Sunshine.

How has this first success in the sun's fight against smoke been achieved? Every gas fire, every gas cooker and every other gas appliance that has displaced a coal fire or coal range means one less smoking chimney. Take a Manchester figure. The increase in the use of gas in Manchester from 1904 to 1924 now displaces the use of 150,000 tons of coal each year and so of necessity prevents 8,800 tons of soot from polluting the atmosphere annually.

That gas has wrought this great improvement is further established by the fact that while London's sootfall was halved and its sunshine increased in proportion—from 1912 until the present time—the number of gas appliances in use in London was almost exactly doubled. In 1912 the gas company whose area of supply includes all central London had three-quarters of a million gas appliances in its consumers' use. Even by 1924 the number had reached a million and a half. Since then the rate of progress has steadily increased. The company has now a million gas appliances *on hire*, apart from those which its consumers own; and the number on hire is actually increasing at the rate of 80,000 a year.

So is it all over the country. In 1902 the output of gas in Britain was 160,000 million cubic feet; by 1912 the 200,000 figure had been passed; by 1925 the total was only just below 300,000 million.

Yet the battle has only begun. As the Coal Report states, "about four times as much coal is still burnt in this country in its raw state, in industrial furnaces, or in domestic grates and ranges, as is carbonized (*i.e.*, turned into gas, coke and valuable by-products) before being consumed." A very large proportion of the coal so burned is, as the Coal Report added, used in a very wasteful manner. Certainly this applies to all the coal, nearly 40 million tons of it, still used for *domestic* purposes each year—doing its work most inefficiently and darkening the atmosphere with smoke.

Gas has already more than started the fight against smoke; it has won a fine initial victory. It is progressing not merely because it is smokeless, but because it saves labour, because it is clean, because it is economical—because people who know it prefer it to coal. When all have learned its claims, sunlight will be won again for Britain.

When this photograph was taken, there were patches of cloudless sky over parts of Sheffield. The gloom below is caused mainly by the smoke from factories in which gas is not used so extensively as it is in Messrs. Walker & Hall's works, from the top of which the photograph was taken. Messrs. Walker & Hall Ltd. have spared themselves no efforts to ensure the use of efficient non-smoke-creating appliances in their works, as will be appreciated when it is known that they consume as much as 16,000,000 cubic feet of gas per annum

Court, Street and Bridge Lighting by Gas

When the face of Buckingham Palace was remodelled a few years ago, serious consideration was given to the artificial lighting arrangements immediately in front of the building. Dignity and beauty of design are the outstanding features of the Gas Lamps which were ultimately placed on the numerous pillars. The lighting itself, when all of the burners are alight, is adequate without being glaring. The whole installation is in keeping with the national importance and dignity which attach to the official residence of the King.

A night photograph of Regent Street—London's best-known shopping thoroughfare. This important street is lighted by means of twenty 3,000 candle-power High-pressure Inverted Incandescent Gas Lamps on columns placed in the centre of the roadway. The mantles are 20 feet above the level of the roadway. The brilliancy of the illumination provided is obvious, as also is the almost complete absence of deep shadow.

Rochester Bridge is lighted by an installation of High-pressure Inverted Incandescent Gas Lamps, each of 500 candle-power, suspended over the centre of the roadway. The lamps are lighted and extinguished from a distance by the manipulation of control taps in the compressor house. At midnight half of the lamps are turned out. This is a good example of the efficiency of, and the uniform illumination which can be provided by, a well-arranged installation of modern gas lamps of adequate candle-power.

Some Exhibits at the Conference of the Institution of Public Lighting Engineers

(Held in Newcastle-on-Tyne, September 14th-16th, 1926)

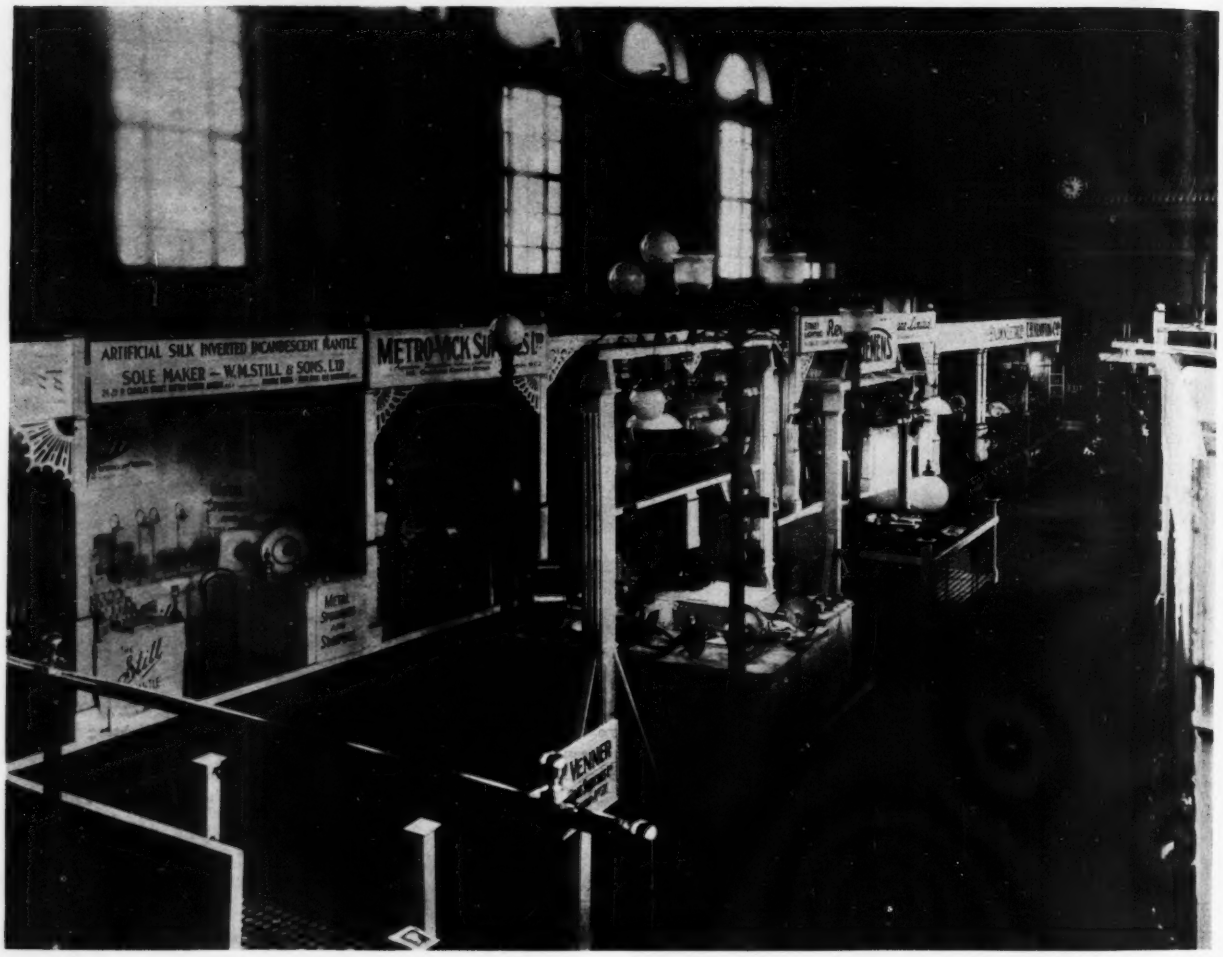


Photo by Sidney L. Gorer, Newcastle-on-Tyne.

WE reproduce above a photograph taken in the Exhibition of Lighting Appliances at the Conference of the Institution of Public Lighting Engineers, held in Newcastle-on-Tyne during September 14th-16th. The photograph was taken from one side, so that only one row of stalls is shown, but it may be mentioned that there are twenty-three stalls in all, arranged in two inclined rows, with a few additional exhibits at the wide end of the "V" thus formed. These three stalls were occupied by the displays of Messrs. Siemens and English Electric Lamp Co. Ltd., The British Thomson-Houston Co. Ltd., and Venner Time Switches Ltd. The row of stalls seen in the illustration included the exhibits of the General Electric Co. Ltd.; W. M. Still & Sons Ltd.; Metro-Vick Supplies Ltd.; Wm. Edgar; Messrs. Falk, Stadelmann & Co. Ltd.; Messrs. Cable Accessories Ltd.; Holophane Ltd.; Messrs. Alder & Mackay; Messrs. Benjamin Electric Ltd.; and Messrs. C. H. Kempton & Co. Ltd.

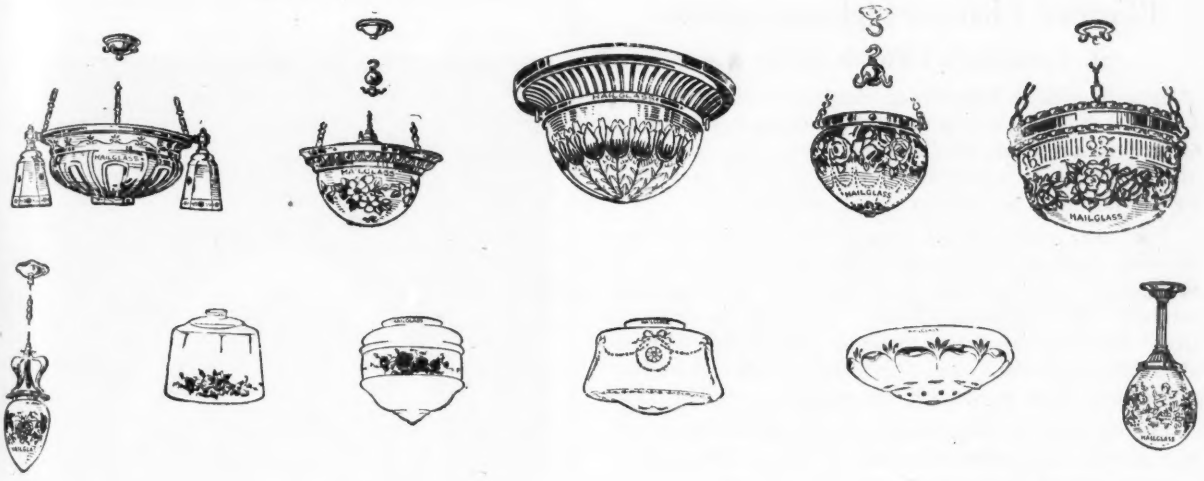
On the other side the exhibitors were Messrs. Wm. Sugg & Co. Ltd.; Messrs. Foster & Pullen; The Photector Co. Ltd.; Metropolitan Gas Meters Ltd.; Municipal Supplies Ltd.; The Horstmann Gear Co. Ltd.; and Messrs. A. E. Podmore & Co. There were thus twenty-three stalls and a comprehensive collection of street-lighting appliances, both gas and electric units being well represented.

Lanterns were shown in great variety, a good selection of units, including some pleasing types of white diffusing glassware being shown by the B.T.H., whilst Metro-Vick Supplies Ltd. showed, amongst other items, the "Brighton" and "Paisley" lanterns, the former consisting of an ornamental white glass globe on a fluted column. One of the chief features of the G.E.C. display was the "Wembley" lantern, which it will be recalled, uses a ventilating arrangement with a high-power gasfilled lamp, and is specially adapted for the lighting of large vertical surfaces. Benjamin Electric Ltd. exhibited a variety of units, including the well-known "Rodalux," and distributing reflector fittings; and Messrs. Siemens & English Electric Lamp Co. Ltd., besides a variety of lanterns, switchgear, etc., made a feature of the new "Siemens Purlite" (internally frosted) lamps.

Holophane Ltd. showed quite a wide selection of their prismatic glassware, which is now adapted for various special problems in street lighting. There were, for example, types specially designed for street intersections, such as the "T" and "4-way" types, and other units with symmetrical distribution for use in parks and open spaces. The Photector Co. Ltd. had on view several of the "Dia" long-burning flame arcs and a number of standard lanterns for use with gasfilled lamps, of which the "catoptric" form, utilizing a parabolic reflector with an internal lining of prismatic glass, attracted special interest. The Electric Street Lighting Apparatus Co. also showed a series of representative fittings, named after the towns in which they have been developed, and the Harrison Patent Longitudinal System.

Amongst the gas exhibits Messrs. Wm. Sugg & Co. had a very complete exhibit, included in which were two of the well-known "Windsor" square lamps, one with a hinged top, and an example of the six-light "Littleton" lamp, fitted with constant-pressure controller, and a four-light model of the same type with an auto controller. (We understand that a number of the latter type of unit are in use in Newcastle.) Other lighting units included the "Promenade" lamp, newly introduced "Promenade" lamp, and "Littleton" and "Rochester" suspension lamps. Sugg's patent distant-control device was also shown in operation, and there were various relics of historic interest.

Many switching and control devices were shown, such as those of the "Esla" type, the Newbridge time switches shown by the Horstmann Gear Co., and the Venner time switches, which occupied a prominent position amongst the exhibits.



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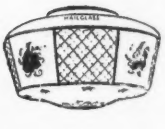

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Effective Chancel Lighting Scheme

St. Columba's Church, Belgravia

St. Columba's (Church of Scotland), Pont Street, London, S.W.1, which is the headquarters of this Church in England, contains some wonderful mosaics, also an imposing communion table, the latter presented by the Baroness Strathcona and Mount Royal.

The lower portion of the mosaics consists of an arcade of seven beautiful panels, while the upper portion has a background of blue and gold, spanned by a double rainbow, with figures in colours. These are constructed from innumerable glass tesseræ, manufactured and assembled in Venice, and "inserted" here by Italian craftsmen. This work took two years to complete.

The lighting of these mosaics and communion table, in order to show them to the best advantage, demanded a high order of illumination, and this was designed by the Illuminating Engineering Department of the General Electric Co. Ltd., in conjunction with the hon. architect, Mr. H. L. Anderson, of 6, Stratton Street, W.1. The installation consists of four "Gecoray" floodlight projectors, each fitted with 200-watt Osram gasfilled lamps, and eight specially designed G.E.C. rectangular polished aluminium floodlight reflectors, also equipped with Osram lamps. These are installed high up behind the chancel arch, and illuminate the golden squared roof, as well as the mosaics, carvings, and altar table shown in our photograph. The electrical contractor was Mr. James Spence, of 70, Mornington Road, North Kensington, who employed flexible metallic fireproof tubing to encase the wiring, and special protective guards for the floodlight reflectors. The Rev. Archibald Fleming, D.D., and the Kirk Session are very appreciative of this installation.

Chancel Lighting in St. Columba's Church, Belgravia.

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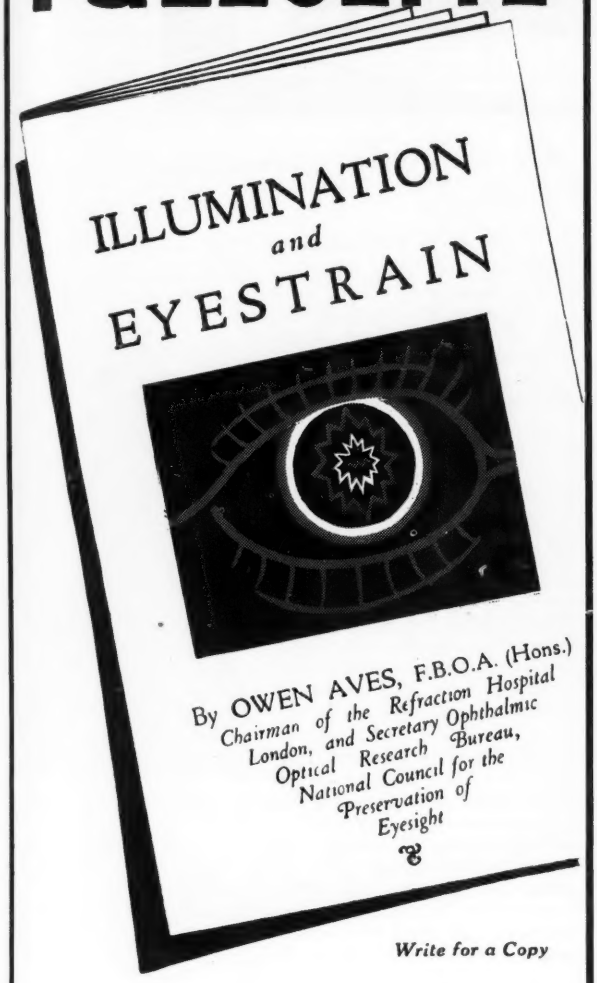

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Electrical Association for Women

AUTUMN PROGRAMME.

A copy of the autumn programme of the Electrical Association for Women has reached us. A feature is the number of visits, e.g., to Mr. Borlase Matthews's electric farm at East Grinstead on October 2nd; to the Coliseum, in order to study stage lighting, on November 17th; and to the Electric House at Croydon, on December 15th. Another item, on November 3rd, is a lecture entitled "The A B C of Electric Lighting," to be delivered by Mr. W. C. Jeary at the E.L.M.A. Lighting Service Bureau on November 3rd. We are very glad to see that lighting figures largely on the programme, for we have always recognized that there are great opportunities for the services of women in this field.

Two Examples of Decorative Lighting

The above illustration, which occurred in a recent Siemens list (Cat. 200), shows an effective bit of decorative lighting which was arranged at the British Empire Exhibition. The photograph gives a good idea of the bright illumination at the foot of the "Chute."

This second picture shows the original Electric Tableau Car in the Littlehampton Carnival held on August 18th. The electrical cooking range, fire-irons, and kettle were of Siemens-Xcel make, and the glassware fitting hanging in the centre is a Siemens "Silvaray."

TRADE NOTES & ANNOUNCEMENTS

DECORATIVE LIGHTING UNITS.

Price List No. 158, issued by Messrs. Siemens and English Electric Lamp Co. Ltd., contains some pleasing illustrations, in colour, of decorative lighting units. The large pieces with coloured patterns on a diffusing white ground are particularly effective, but smaller shades of the same material are also available. One is very glad to find these forms of diffusing glassware becoming more general, in place of the crude tinted shades which were in common use up to a few years ago.

A view of one of these pleasing units is shown in the accompanying illustration (Fig. 1.).

FIG. 1.—One of the Siemens Decorative Lighting Units.

Further details on Siemens lamps are included in the new catalogue (No. 200), which gives a good idea of the great variety now available. Lamps are divided into four groups, covering standard lighting lamps, automobile, and projector types, flashlights and miners' lamps. The first group is a comprehensive one, including such items as daylight, Silvalux (opal bulb), spray-enamelled and neon lamps, as well as many forms with special filaments. In each case the illustration of the lamp is accompanied by data as regards wattage, dimensions, price, etc., and the sprayed lamps are shown by two coloured illustrations. At the beginning of the catalogue is a group of illustrations, mainly of lighting installations in shops, streets, etc.

Yet another production is the little "Siemens milometer." Whilst containing notes on lamps and information on lighting, this folder also includes a coloured map of England with a transparent scale in miles, pivoted at London. By adjusting the scale anyone can see at a glance the distance of London from any spot he desires to visit.

"J. K. W." SOLID-CONTACT LAMPHOLDERS.

Our attention is drawn to another form of improved lampholder, that issued by Messrs. J. W. K. Manufacturing Co. Ltd., of Middlesbrough. In general outward form it resembles the ordinary type of lampholder, with which it is interchangeable for practical purposes. The outstanding feature is the elimination of the small plunger strings which have proved a frequent source of trouble, and the construction of the contacts in one solid piece. It will be observed that the single large spring which maintains contact is fixed in the top of the case away from all live parts. This spring rests on the internal projection of the top part of the case, so that when the lamp or an adapter is in circuit the spring exerts the necessary pressure on the back of the standard "S" porcelain interior, to which the solid contacts are fitted, and so maintains effective contact. It should be noted the design is inherently "anti-vibration," so that it should be particularly suitable for street-lighting work and in factories, workshops and similar situations. For use in tropical climates the simplicity and robustness of the various component parts, and the general construction which makes for freedom from corrosion troubles, are specially valuable features.

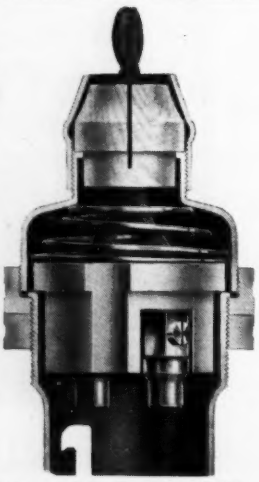

FIG. 3.—"J. K. W" Solid Contact Lamp Holder.

A NEW STREET-LIGHTING LANTERN.

The adjacent illustration (Fig. 2) illustrates the new catoptric lantern, mentioned in our last issue as one of the features of the exhibit of the Photector Co. Ltd. at the Conference of the Institution of Public Lighting Engineers. As is evident from the figure, the lantern consists in a parabolic reflector with a prismatic glass lining. We understand that units of this kind are playing an important part in Continental street lighting. There is a school of thought abroad that believes in the use of relatively deep reflectors, similar to those commonly used for industrial lighting, for the lighting of streets. The great advantage claimed for the method is that the filament is completely concealed from view, and glare is thus avoided. It is possible that by this means some want of uniformity in illumination between lamps may arise, but this is considered of less consequence than the avoidance of glare—especially as, with correct design, the change in illumination is very gradual. We understand, moreover, that the introduction of the prismatic lining is of considerable benefit in giving a more extensive curve of distribution of light than would otherwise be obtained, and the fact that the glass is quite easily cleaned is a manifest advantage.

FIG. 2.—The New Catoptric Lantern for Street Lighting.

PHILIPS ELECTRIC LAMPS.

The revised list of Philips Lamps (No. 164) is an attractively printed production, the arrangement of inside pages with the series of labels of different forms of lamps, executed in red on black panels with a light blue border, being particularly neat. All needful data are given and the types listed include numerous special varieties, such as the Argenta (white bulb) Night Lamps (neon gas-filled), "Savelite" Lamps, etc. In a note on the back page it is recalled that the first Philips Lamp was made 37 years ago—and to-day the output of the Philips Lamps is at the rate of nearly two million a week.

CONTRACTS CLOSED.

The following contracts are announced :—

MESSRS. SIEMENS AND ENGLISH ELECTRIC LAMP CO. LTD.:

Southern Railway; for Gasfilled and Vacuum Lamps and Train Lighting Lamps for the period of six months from September 1st, 1926.

General Post Office; Gasfilled Lamps and Vacuum Lamps for 12 months ending August 31st, 1927.

Aberdeen Line; for the supply of all types of Siemens Electric Lamps for their steamers.

METRO-VICK SUPPLIES LTD.:

Southern Railway; for "Cosmos" Lamps, including Gasfilled, Vacuum Metal-filament, Traction, Carbon-filament, Automobile and Flashlight Lamps, for a period of six months from September 1st, 1926, to February 28th, 1927.

Post Office, Stores Department; for "Cosmos" Gas-filled Lamps and Vacuum Tungsten Lamps for a period of 12 months ending August 31st, 1927.

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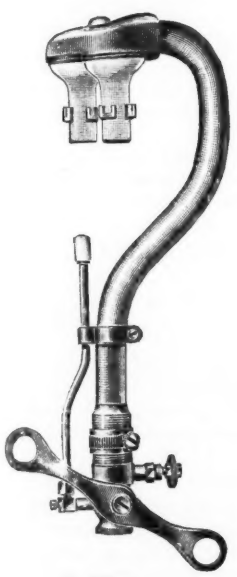

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THE NEW SEASON'S OSRAM CAMPAIGN.

In our last issue we drew attention to the measures being taken by leading firms in the lighting industry to supplement the Better Home Lighting Campaign being launched by the E.D.A. and E.L.M.A.

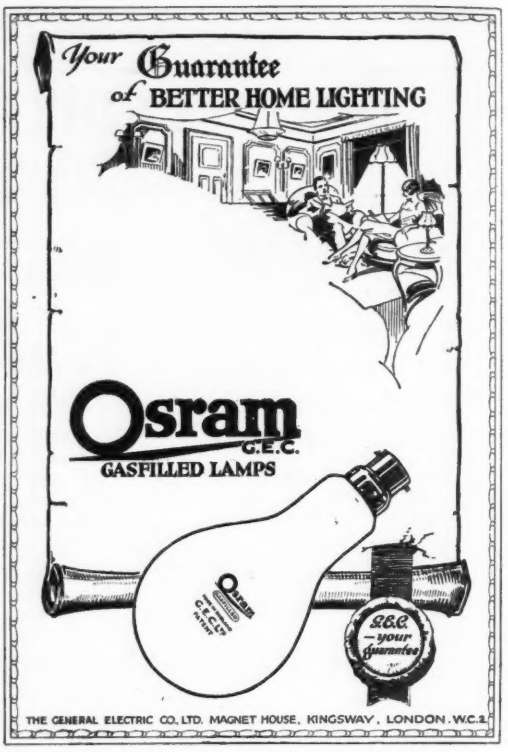
Another instance is afforded by the new season's Osram campaign, which is being initiated by the General Electric Co. Ltd. on the 1st of this month. A booklet will shortly be circularized direct to upwards of a million electric lamp users. This will contain a striking account of the organization behind behind the Osram lamp, and will present interesting facts and figures relating to its manufacture.

The domestic and industrial user and the trade will likewise be approached by means of an extensive press campaign. Attention will be concentrated on methods of obtaining better lighting by the use of Osram lamps, and the slogan, "The G.E.C.—Your Guarantee," finds expression on the latest showcards and window transparencies. Naturally the new Pearl (internally frosted) Osram gasfilled lamp will be widely brought before the public, and other new showcards deal with the value of Osram automobile clear and anti-dazzle lamps to motorists and motor-cyclists.

Full particulars of the campaign are being issued to the trade by means of an effective "broadside" entitled "Mass Selling to the Millions," and copies may be obtained on application to the General Electric Co. Ltd., Publicity Department Organization, Magnet House, Kingsway, London, W.C.

The particular showcard which we reproduce is directed to the domestic user, and is in line with the "Better Home Lighting" campaign.

We may also take this opportunity of drawing attention to an ingenious novelty being introduced by the company—the Osram lamp life calculator. This consists of a movable dial, with a scale of lamp life in hours, with a second disc divided according to the months of the year as a background. By setting the zero on the hour scale opposite the date at which the lamp was put in service the number of hours for which the lamp has burned can be at once ascertained.



ANOTHER "MAZDA" SHOWCARD.

In our September issue we referred to the extensive publicity campaign being undertaken by the British Thomson-Houston Co. Ltd., and reproduced one of the most striking "cut-outs" recently introduced. The accompanying picture shows another which has been at least equally successful—the three children solemnly examining a "Mazda" gasfilled lamp, with the legend underneath, "Daddy Says It's Bottled Sunshine."

We have also to acknowledge the receipt of particulars of various up-to-date "Mazda" equipment for home lighting. A sectional view of one of the most original of these, the B.T.H. "Eye-Restolite," is appended. It will be noted that this unit consists of an X-ray reflector above and a diffusing bowl below, the whole being mounted within a silk shade—the effect being to furnish both local illumination below and indirect lighting above. This unit can be fitted to any floor or table standard.

ILLUMINATING ENGINEERING SERVICE.

We notice that Messrs. Metro-Vick Supplies Ltd., are in line with other progressive firms in offering "Illuminating Engineering Service." A specimen form sent us provides for all the data necessary in order to prepare an initial scheme of illumination. On receipt of such forms, duly filled in, the Company will send to consumers a bound specification, and if desired representatives will call and make a survey of the building and discuss the lighting problems in detail. Such assistance is naturally often of considerable value both to customers and to consulting engineers.

STAGE LIGHTING.

The paper on "Stage Lighting" recently read by Mr. H. R. Lester Groom before the Illuminating Engineering Society has now been reprinted from *The Illuminating Engineer* in pamphlet form, and copies are obtainable from the General Electric Co. Ltd. In the pamphlet some additional illustrations have been included and the paper contains a useful survey of the technique of this somewhat intricate subject.

VENNER TIME SWITCHES.

During a recent visit to the factory of Messrs. Venner Time Switches Ltd., in Horseferry Road, we had an opportunity of examining many interesting and ingenious switches of this type, which were a prominent feature at the exhibition in connection with the recent Conference of the Institution of Public Lighting Engineers in Newcastle. We hope shortly to give some further particulars of these special devices, but it was quite a revelation to find how varied are the conditions they have to meet.

CEAG LTD. NEW COMPANY FORMED.

We are informed that a new company, "Ceag Ltd.," has been formed to take over the existing business of the "Ceag" Miners' Supply Company Ltd. The change, however, is only a formal one, and no alteration will take place in the management and organization of the new company. In future, however, all communications should be made to "Ceag Ltd.," in whose name all future orders and contracts will be made.

BENJAMIN WIRELESS COMPONENTS.

We have received copies of some attractive leaflets dealing with Benjamin "Shortpath" radio valves and wireless components, including the well-known anti-microphonic valve-holder. These and other Benjamin devices attracted much attention at the recent Wireless Exhibition, and we believe it is no secret that the sales of some of these accessories have recently been phenomenal.

Opportunities in the Field of Domestic Lighting

An article contributed by Mr. C. W. Sully (Director of the E.L.M.A.) to *The Electrical Times* contains some striking statistics on developments in electric lighting. There can be no question of the great growth of public interest in illumination during recent years, and Mr. Sully mentions various agencies which have contributed towards this advance. He recalls that the Illuminating Engineering Society has for many years advocated the scientific application of all forms of illumination. More recently valuable research work has been initiated by the committee working under the Department for Scientific and Industrial Research, and by several committees of the British Engineering Standards Association. In 1923 an important new development was the formation of the E.L.M.A. Lighting Service Bureau, whose work in arranging demonstrations of the benefits of good methods of lighting is familiar to our readers.

As an illustration of the growth of electric lighting the following figures for sales of lamps in this country are quoted: 1916, 15 millions; 1922, 20 millions; 1925, 36 millions. The statistical reports issued by the Electricity Commissioners also contain suggestive figures in regard to the units of electricity generated in the United Kingdom. In the year 1922-23 the units generated for power purposes formed 65·9 per cent. of the whole, and the units generated for lighting and domestic use 18·3 per cent. The value of these figures, however, is very different when expressed in terms of actual income, as they then become transformed thus: For power purposes, 47·6 per cent.; for lighting and domestic use, 52·4 per cent. Thus, whilst the proportion of units applied in the domestic field is relatively small, the *revenue* actually forms a greater proportion of the whole than that derived from the sale of electricity for power. This is obviously a point that should be carefully borne in mind by supply undertakings, who should do everything possible to encourage public interest in illumination.

In the final portion of his article Mr. Sully quotes figures to show the great opportunities for further progress in domestic electric lighting. It is estimated that in 1925 the number of inhabited buildings in England and Wales was 8,262,000, and of these only 1,601,000 are at present electrically connected.

The Movement for Better Home Lighting

The Electrician, in commenting on the big autumn campaign on "Wiring the Homes of Britain," expresses the hope that the *lighting* side will be properly emphasized. In recent wiring schemes, it is remarked, there has been some tendency to concentrate mainly on the heating and cooking side. But lighting still remains the backbone of the business, and from the *revenue* standpoint it may still overshadow other domestic applications of electricity. In a model electric home the effort should be to provide every facility that lighting can offer.

After discussing some typical problems in the lighting of the home, the article recalls that much harm was done by past injudicious propaganda, based unduly on comparisons of cost, and having the result of instilling the idea that, however extravagant a person may be in other other directions, he must at all costs economize in lighting.

The article proceeds: "Let us not make this mistake again. The consumer should be made to see that electric light is one of the cheapest of commodities, and that he is well repaid for what he spends upon it. In the long run he will not suffer by being somewhat more liberal in this respect. . . . . In conclusion, we would urge that, whilst the coming campaign should help manufacturers, supply undertakings and contractors, its success will be enhanced if they can secure the co-operation of independent bodies. Efforts to push the sale of electricity and electrical appliances are greatly aided by the element of 'service'—the giving of useful advice and guidance to the consumer."

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The Illuminating Engineer

The Journal of

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SPECIAL INFORMATION.

THE ILLUMINATING ENGINEER (the Journal of GOOD LIGHTING) was founded in January, 1908, and has thus been in existence for eighteen years.

SINCE the year 1909, when the Illuminating Engineering Society was founded in London, it has been the official organ of the Society.

IT is *the only journal in this country exclusively devoted to Lighting by all Illuminants.*

IT receives the assistance of contributors who are leading experts on illumination in this country and abroad. Foreign Notes and News will be a speciality, and correspondents have been appointed in all the chief cities of the world.

THE Journal contains *first-hand and authoritative information on all aspects of lighting;* it has also been improved and extended by the inclusion of a *Popular and Trade Section* containing special articles of interest to contractors, gas and electric supply companies, Government Departments and members of the Public.

DISCUSSIONS before the Illuminating Engineering Society which are reproduced in this Journal are participated in alike by experts on illumination and *users of light*, whose co-operation is specially invited.

Good Lighting is of interest to everyone. The Journal is read by engineers, architects, medical men, factory inspectors, managers of factories, educational authorities, public lighting authorities, and large users of light of all kinds.

BESIDES being issued to all members of the Illuminating Engineering Society, the Journal has an independent circulation amongst people interested in lighting in all parts of the world. The new and extended form of the Journal should result in a continual and rapid increase in circulation.

Every reader of THE ILLUMINATING ENGINEER, the Journal of GOOD LIGHTING, *is interested in illumination, and is a possible purchaser of lamps and lighting appliances. Gas and Electricity Supply Undertakings likewise benefit by the movement for Better Lighting, with which the Journal is associated, and which stimulates the demand for all illuminants.*

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JOIN
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Monthly meetings are held, at which interesting papers are read, and discussions on such subjects as the lighting of streets, factories, schools, libraries, shops, etc., and exhibits of new lamps and lighting appliances take place.

Members receive *The Illuminating Engineer*, the official organ of the Society, free.

The Society preserves an impartial platform for the discussion of all illuminants, and invites the co-operation both of experts on illumination and users of light; it includes amongst its members manufacturers, representatives of gas and electric supply companies, architects, medical men, factory inspectors, municipal officers, and many others interested in the use of light in the service of mankind.

The Centre for Information on Illumination.

For particulars apply to:

L. GASTER, *Hon. Secretary*, 32, Victoria Street, LONDON, S.W.1.